

Low Level Laser Therapy (LLLT) Combined with Physical Exercise, A More Effective Treatment in Low Back Pain

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Abstract:

Introduction: Low back pain is one of the most common musculoskeletal disorders, which is prevalent among the public population. Depending on the severity of the patients' pain, different treatments are selected for them. Few studies have addressed, so far, the therapeutic effects of laser in such pains and different results have been published in this regard. The aim of this study is to investigate the therapeutic effect of low intensity laser therapy (LILT) on these diseases.

Methods: Sixty patients are randomly divided into three groups, one received low intensity laser therapy (LILT), the second group the low intensity laser and physical exercises simultaneously and the other the laser placebo and physical exercises simultaneously. Laser therapy was performed for 6 weeks, two sessions per week. Pain and disability were measured and compared, at 0, 6 and 12 weeks after the treatment in the three groups.

Results: Patient's disability in groups 1 and 2 at week 6 showed a significant improvement compared to the beginning of the study. (Group I, $P=0.02$, $P=0.012$, group II, $P=0.031$, $P=0.042$, respectively). The rate of pain and disability at the week 12 improved significantly compared to the week 6 of the study in each group of 1 and 2. (Group I, $P=0.002$, $P=0.02$, group II, $P=0.043$, $P=0.02$, respectively). In the comparison of the groups at week 12, the values of pain ($P=0.02$) and disability ($P=0.03$) had improved in group I (laser therapy accompanied with physical exercise).

Conclusion: Our Results revealed that laser therapy accompanied with physical exercise can be the most effective way for improving the chronic back pains including pain relief and reduction of disability in the patients.

Keywords: low back pains, low level laser therapy, physical exercise, disability, pain

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Introduction

Low back pain is the most common reason for

referring to physicians. More than two third of individuals experience it during their usual life (1,2).

This condition is accompanied by disability and absence from work and imposes a heavy economical burden on governments (3). Recent studies have shown that, more than 90% of patients feel some improvements; however, the remaining 10% need treatment, the improvement is slow and often needs treatment interventions (4). Lumbar Spinal Stenosis and degenerative disc disease are related with few numbers of these symptoms. Therefore, in the majority of patients, pain has a non-specific origin (5). Main non-medication treatments, based on the type of primary etiology, include patients' training, particular physical exercises, ultrasound waves for stimulation of nerves and Acupuncture (6). Many authors have reported significant pain reduction with low level laser therapy in acute and chronic painful conditions (7-11). Low level laser therapy may also be an effective adjunctive or alternative treatment for chronic low back pain with avoidance of systemic drug use (12). The aim of this study was to find out if combination of low intensity laser therapy and exercises is a rational treatment for chronic non specific low back pain.

Methods

Our study was conducted as a randomized controlled trial. Sixty patients were divided randomly into three groups using block randomization with a manual schedule. For every six participants recruited, two were assigned randomly to each group. Also subjects of each group were matched by age and gender. All patients stated having a chronic back pain for more than 12 weeks. The first group underwent low level laser therapy, the second group underwent low level laser therapy accompanied by physical exercises and the third one underwent just physical exercises with laser placebo.

Laser therapy (or treatment with laser placebo) was carried out for 6 weeks, 2 sessions per week for all patients. Patients were blinded of the fact that whether they received actual laser or placebo.

Patients were referred to us from orthopedic, Neurosurgery and pain clinics for treatment. Patients were between 18 to 65 years old. Patients were including in the study by their personal consent and also learned all instructions. Patients were excluded from the study in the case of any underlying pathology of discs and vertebra including

degenerative disc disease, herniated lumbar disc, fracture, spondylosis, narrow spinal channel, nerve deficiencies, laboratory abnormal findings, history of prior allergy to laser, the presence of underlying diseases such as cardiovascular diseases, diabetes, the history of long use of psychological and or nerves medications, pregnancy and the history of major surgery during the last year. Physical exercises were under the supervision and control of physiologist which include such techniques as tension, strength, concentrated movements on pelvis, back, paravertebral muscles and lower limbs muscles for three times a week and each course contained at least 20 to 30 minutes physical exercise.

The laser employed was Gallium Aluminum Arsenide (GaAlAs). The radiation area, was paravertebral eight points (T12 –S3), which was radiated by a laser probe $\lambda=810$ nm, 50 mW, continuous wave, and 0.2211 cm² spot area.

The power output was calibrated with a thermopile power meter. In patients who received real laser, participants were irradiated with the probe emitting a dose of 27 J/cm² while the placebo laser contained inactivated probes.

The main variables under the study were pain and movement disability. In order to measure the intensity of patients' pain, a patient's pain report was taken, the patients' pain report based on visual analogue scale (VAS) was the criteria of measurement. The criteria included a 100 mm line scaled from 0 to 100. The lack of pain is considered equal to 0 and the maximum intensity of pain is considered equal to 100.

Moreover, disability was recorded via Oswestry disability questionnaire (ODI) which includes 10 questions, each of which are scoring from 0 to 5. The higher total score implies the greater disability. The evaluation of the patients' scores and the comparison of the groups were conducted at two turns, 6 weeks and 12 weeks after the treatment. The general issues of the project have been confirmed by ethics committee of Shahid Beheshti's university of medical science.

Mean, median, range, standard deviation, frequency and frequency percentage were determined using statistical software SPSS V.19 and using descriptive analysis. For comparison of qualitative averages, independent T test was used after the normal distribution of data was tested

to determine whether it is followed by 1-sample KS; and k.s-T test-Chisquare statistical test was used for the comparison of qualitative ratios. In all tests, significance level was considered as two tails and P value less than 0.05.

Results

No one of 60 patients under the study was excluded or exited from the study during the period of the study and after it. Demographic data of patients including age and sex, as well as body mass index (BMI), the pain period, education level, prior history of back pain, the history of smoking was gathered that are summarized in the table 1.

As shown in this table, the three studied groups had not any statistical difference in this regard.

No related treatment complication was observed in patients. According to the given results, patients pain mean as well as the mean score for patients disability in all patients at the week 6 showed a significant improvement compared to the beginning of the study. (Group I, $P=0.02$, $P=0.012$, group II, $P=0.031$, $P=0.042$, Group III, $P=0.047$, $P=0.045$, respectively). (Table 2)

The rate of pain and disability at the week 12 improved significantly compared to the week 6 of the study in each group of 2 and 3.

Table 1. Subjects Characteristics

	Group 1	Group 2	Group 3
Age	37 ± 3.3	39 ± 4.1	38 ± 3.5
Gender (Male)	10 (50)	9 (45)	9 (45)
BMI	25.2 ± 2.3	26.4 ± 4.1	25.5 ± 3.4
LBP history	11 (55)	10 (50)	10 (50)
Recent LBP duration (week)	22 ± 3.5	23 ± 3.1	24 ± 3.6
Smoking history	7 (35)	7 (35)	6 (30)

Table 2. Mean of each group for pain and disability

	Week 0	Week 6	Week 12
Pain			
Group 1	7.7 ± 2.1	5.2 ± 1.2	2.3 ± 0.7
Group 2	7.8 ± 2.3	6.3 ± 1.8	4.4 ± 1.6
Group 3	7.4 ± 2.1	6.5 ± 1.7	3.9 ± 1.7
disability			
Group 1	33.2 ± 9.8	24.3 ± 8.4	17.3 ± 5.3
Group 2	33.8 ± 10.2	29.8 ± 9.1	25.4 ± 7.8
Group 3	34.1 ± 9.9	29.3 ± 9.2	26.5 ± 6.6

Group 1: Patients who underwent the low level laser therapy

Group 2: Subjects underwent low level laser therapy accompanying with physical exercises

Group 3: Patients underwent just physical exercises with laser placebo.

(Group II, $P=0.043$, $P=0.02$, Group III, $P=0.002$, $P=0.02$, respectively) Group I had no significant improvement in the rate of pain and disability at the end of the study period.

In the comparison of the groups, at the week 6, no significant statistical difference was observed between the values of pain and disability. In the comparison of the groups at week 12, the values of pain ($P=0.02$) and disability ($P=0.03$) had improved in group II (laser therapy combined with physical exercise)

No statistical significant difference was observed between the groups. However, the value of pain ($P=0.03$) and the rate of disability ($P=0.042$) of group II had been improved significantly compared with the other two groups (Group I and Group III)

Discussion

Our study revealed that laser therapy accompanied with physical exercise can be the most effective way for improving the chronic back pains including pain relief and reduction of disability in the patients.

According to a review study published, which studied all treatments available for the chronic back pain, it has been shown that multiple treatments have better results compared to single-agent treatments (13).

The most effective introduced therapeutic method in the physical exercises studies are those which are under the supervision of related specialist. However, the very studies claim that mere physical exercise does not show enough therapeutic effects. This is enough for showing that there is a need for combining the given therapeutic method with the other methods (7-11).

The suggested methods include the use of medications, Acupuncture, treatment with magnetic ray, massage therapy and low Level laser therapy (1,2).

Some previous studies have shown the usefulness of the use of low Level laser, although some of them have shown that the low Level laser reduce the pain intensity and patients disability, but only the short term improving effects of this treatment have been proved (12). While we revealed in our study that low Level laser in therapeutic combination with physical exercises may be effective in a long run and reduce the pain intensity and patient disability. Nevertheless, this result does not reduce the importance of the physical exercises in the treatment of patients (the third

group) and we consider this laser therapy efficient as a supplementary treatment along with physical exercises.

Our study had shortcomings too. First, main etiology of patients had not been identified and compared, that could lead to some differences in the therapeutic results.

The sample size was so small that probably it does not show some differences. It was better that in this study, the more proper placebo be used for the control group. So, it is suggested that future studies be done as multi centric and also with higher sample size. It is recommended that in the future studies a longer period of treatment be considered.

Conclusion

As a conclusion we could say that our study revealed that laser therapy accompanied with physical exercise can be the most effective way for improving the chronic back pains including pain relief and reduction of disability in the patients at least in an acute treatment period.

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