Pharmacophore

ISSN-2229-5402

Journal home page: http://www.pharmacophorejournal.com

THE EFFECT OF LOW-POWER AND HIGH-POWER LASER THERAPY ON PAIN, TENDERNESS AND GRIP FORCE OF THE PATIENTS WITH TENNIS ELBOW

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ARTICLE INFO

Received:
30th Sep 2018
Received in revised form:
28th Apr 2019
Accepted:
09th Jun 2019
Available online:
28th Jun 2019

Keywords: tennis elbow syndrome, low-power laser therapy, pain, tenderness, grip force

ABSTRACT

Objective: Tennis elbow disorder causes pain and tenderness in the lateral section of the elbow and it has also been found reducing the grip force of the individual. The objective of the current research paper is a comparative evaluation of the effect of high-power and low power laser therapy on the pain, tenderness and grip force of the patients with such a syndrome. Study Method: Thirty individuals previously diagnosed with tennis elbow disorder participated in the study after being subjected to the study inclusion and exclusion criteria. The variables studied herein were the pain intensity, tenderness and the grip force of the participants. The aforementioned variables were examined based on visual pain scale, algometer and dynamometer before and after the treatment. The study subjects were randomly assigned to two treatment groups: 1) group one, which was subjected to the high-power laser therapy and common treatments (n=15) and 2); group two, which was subjected to low-power laser therapy and common treatments. The treatments were administered in ten sessions, six days in a week. Evaluations were carried out at the beginning, and the end of the treatment sessions by a therapist. To determine the changes in the variables in both of the treatment groups after the termination of the treatment sessions, paired t-test was used, and independent t-test was applied to compare the two foresaid methods. Findings: The results of the study indicated that the effect of the high-power laser therapy along with the common treatments were statistically significant in the reduction of pain, tenderness and the increase in the grip force of the patients ($P<0.05$); also, the use of low-power laser therapy along with common treatments was found creating significant differences ($P<0.05$), but a comparison of the two treatment groups was not suggestive of any significant differences between them in terms of any of the variables ($P>0.05$).
Conclusion: Both types of low-power and high-power laser therapy along with common physiotherapy treatments were effective on the reduction of pain and tenderness and the increase in the grip force of the patients with tennis elbow; and they did not show any significant differences.

To Cite This Article: Leila Fekri, Alireza Rezvani, Noureddin Karimi, Kamran Ezzati (2019), "The Effect of Low-Power and High-Power Laser Therapy on Pain, tenderness and grip force of the Patients with Tennis Elbow ", ***Pharmacophore, 10(3),*** *89-95.*

Introduction

The lateral section of elbow tendons disorder or tennis elbow is a common condition featuring a 1.7% prevalence rate, and it most often occurs during the thirtieth or sixtieth of an individual's life [1, 2]. The disease causes pain and tenderness on the outside of elbow and largely debilitates the individual's grip force [3, 4].

There are numerous widely used methods in physiotherapeutic domain [5] of the disease treatment including shockwave therapy, acupuncture, friction massage, laser therapy, cryotherapy and tapping [1]; in the meantime, laser therapy is another commonly used but controversial method of treatment [6].

Laser is an abbreviation for light amplification by the stimulated emission of radiation [7], and it is a fraction of electromagnetic wave spectrum and it is usually used in wavelengths ranging from 600 nm to 1100 nm (700 nm to 1100 nm in invisible domain of the laser, and 300 nm to 700 nm in visible or red domain) [8].

Lasers are classified based on their power. The low power laser possesses a power in a range from 2 mW to 500 mW, and the high-power lasers have powers exceeding 500 mW.

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Laser causes an increase in blood circulation, the increase in the production of ATP and collagen, and enhancement of tissue repair [8].

There have been numerous studies that were indicative of the effectiveness of laser on the reduction of pain in musculoskeletal disorders such as tennis elbow. The effect of laser on pain has been found connected to its effect on inflammation, tissue repair, nerves guidance and secretion of endorphine; of course, there have been studies that have not indicated a considerable effect of laser therapy on the reduction of pain and changes in the other variables [8].

Haker et al.(1990), Vasseljen (1992), Gam et al. (1993) and Krasheninnikoff et al. (1994) each in separate studies dealt with the effectiveness of low power laser therapy in patients with tennis elbow, and reported its lack of effectiveness on the reduction of pain and enhancement of the patients' grip force [9-12].

Bjordal et al., (2008) and Stasinopoulos & Johnson (2005) stated that the effect of low-power laser depended on the parameters based on which it is used and if there were evidences indicating its ineffectiveness, it was highly likely that it has not been used in an appropriate dosage [2, 6]. [4, 13] in two separate studies reported the positive effects of low-power laser along with exercise therapy on the reduction of pain, and enhancement of grip force in patients with tennis elbow.

Dundar et al., (2015) showed the significant effect of high power laser on the reduction of pain, and elevation of the grip force as well as the other symptoms of the patients with tennis elbow, and of course it was found not being significantly different from the effect of making use of brace [3].

According to the fact that there have been contradictory reports regarding the effect of low-power laser on tennis elbow syndrome [14] and, on the other hand, there has been a scarcity of the studies, mostly narrow and limited, in regard of the high-power laser effect [3] and the results of these scarce studies were not at all convincing and adequate, a comparative study of the effects of high-power versus low-power laser therapy on the pain, tenderness as well as the enhancement of the grip force in the patients with tennis elbow syndrome has been considered as the present research paper's objective.

Study Method:

The study sample volume was consisted of thirty patients with tennis elbow syndrome (32 to 67 years of age) who had referred to physiotherapy clinics in the city of Tehran based on a pre-diagnosis by the orthopaedy specialist. The study subjects all met the following requirements: (lasting less than 3 mounth) pain on the outside of elbow [3], local tenderness when being touched over the lateral epicondyle [3], feeling pain on the outside of elbow when resisting to an extension of the wrist or the middle finger [3], positive Mill test [3] (the therapist places his thumb on the patient's lateral epicondyle and passively moves the forearm to pronation position, the elbow to extension and the wrist to a flexion as a result of which an intensified pain is felt in lateral epicondyle) [15]; the study subjects were excluded in case any of the following cases were present: fibromyalgia [3], rheumatoid diseases [3] were figured out according to the patients' prior examinations and a pre-diagnosis by the physician, carpal tunnel syndrome [3] (by taking advantage of Phalen test), cubital tunnel syndrome [3] (by the use of tinel sign), neck radiculopathies [3], a past history of elbow surgery [3] and finally an absence for more than two sessions in the course of treatment.

The subjects were assigned to two low-power and high-power laser therapy groups, and each was subjected to the preliminary evaluations that included: a VAS-based assessment of pain in which the patient was asked to mark the intensity of the pain s/he was feeling on a line from 1 to 10; the tenderness evaluations were carried out by the use of FG5005 Algometer which is a device of 1 square centimeter in area, and it digitally records the amount of pressure exerted on a plate. Also, the tenderness threshold was measured three times within 30s intervals, and an average score was calculated for them. Grip force was examined by the use of Saehan SH5008 Dynamometer Device in such a manner that the patient was asked to place his both hands on the device's bubble and press it with all his strength (with his elbow being in a 90-degree flexion), a figure would appear on a scalar screen, and the evaluation was repeated three times, and an average score was computed for them which was indicative of the patients grip force, and it was also considered as the main grip force input in the studies. All of the patients were subjected to ten treatment sessions, and then the aforesaid evaluations were all carried out again by the examiner. In the meanwhile, the patients were asked not to take any drugs during the physiotherapy sessions of course via counseling with their corresponding physician and asking for permission. The patients did not have any idea about the laser power that was going to be applied for them. Also, the patients continued their routine treatment which incorporated the following treatment plan: (conventional) TENS for twenty minutes in elbow region; the use of pulse ultrasound with duty cycle 80% on the lateral epicondyle for five minutes with an intensity of 0.8 W per every cm^2 [10]; the use of ice for ten minutes [16]; training for correcting the daily activities to minimize pressure on the elbow (preferentially, holding, lifting and pressing the objects were asked to be carried out in supination) [16]; and, stretch and strain wrist muscle strengthening exercises [16].

High-power laser used in the present research paper was MLS Laser, Model M6 (ASA), that was included in class four lasers device, with maximum 25-Watt power, average power of 3.3 Watts, wavelength of 808 nm in a continuous state. The target region diameter in this device was 5 cm and the energy used for treating the patients was 272.4 Jules, and the energy density was 13.89 Jules per cm^2 with a 700-hertz frequency for a period of three minutes on the lateral epicondyle and the origin of the wrist's extensor muscles.

The low power laser device used herein was the AL170 Model procured from Novin Company. This has been included in class three lasers device with the wavelength of 808 nm, power of 100 mW and it is radiated in a discontinuous state (100

ms) in 50% duty cycle. The laser was introduced in 250-Hertz frequency with dosage of 8 Jules per every cm^2 for four minutes on lateral epicondyle and the origin of the wrist's extensor muscles.

Results:

To investigate the identicalness of the variables among the groups, independent t-test was applied, and paired t-test was used to evaluate the significance level of each variable before and after the onset of the treatment in both of the study groups (See Tables 1, 2, & 3).

Table 1: investigating the mean pain before and after the treatment in both of the groups

Groups	Before treatment M±SD	After the treatment M±SD	p-value (paired t-test)
High-power laser	7.66±1.75	5.26±1.94	<0.001
Low-power laser	7.06±1.94	5.50±2.29	<0.001
p-value (independent t-test)	0.668	0.598	

Table 2: investigating the mean tenderness before and after the treatment in both of the groups

Groups	Before treatment M±SD	After the treatment M±SD	p-value (paired t-test)
High-power laser	-6.35±2.11	-10.49±3.94	<0.001
Low-power laser	-9.22±3.08	-11.21±3.17	<0.001
p-value (independent t-test)	0.094	0.258	

Table 3: comparing the mean grip force values before and after the treatment in both groups

Groups	Before treatment M±SD	After the treatment M±SD	p-value (paired t-test)
High-power laser	16.86±7.79	22.20±8.59	<0.001
Low-power laser	15.46±7.73	19.26±9.71	<0.001
p-value (independent t-test)	0.686	0.618	

According to the obtained statistical results, the changes in mean values of the variables "pain" and "tenderness" and "grip force" in both of the high-power and low-power laser groups have been found indicative of significant differences after the treatment in contrast to before the treatment (p-value<0.05); and comparing the mean values of the two high-power and low-power laser therapy groups was not found reflective of significant differences (P-value>0.05).

Discussion:

The Effect of High-Power and Low-Power Laser on Pain:

The effect of laser on pain might be connected to its influence on the inflammation, tissue repair (increase in collagen synthesis), nerves guidance and secretion of endorphins (which is a natural analgesic produced in the human beings' bodies) [8].

Laser therapy of the tennis elbow syndrome has been conducted in the prior studies in a limited manner, and the evidences pertaining to the low-power laser results were more frequent.

The effect of laser on the study variables in any research depended on the parameters based on which the laser device has been used, including its power, wavelength, frequency, laser energy and the number of sessions) as expressed by Stasinopoulos & Johnson (2005) "the ideal dosage of laser is yet to be discovered and if laser therapy is found ineffective in a study it can be due to making use of inappropriate dosage as a result, optimal results cannot be attained" [5]. In the study conducted by Haker et al., (1990), low-power laser was applied on elbow's acupuncture spots as equivalents to the motor points of the wrist's extensor muscles. The study only radiated laser beams on the muscles, and no effect was found in terms of pain reduction. The result of the aforesaid study indicating the ineffectiveness of laser therapy can be questioned for its not applying laser beams on the affected tendons because the main tendon which affected by tennis elbow syndrome was lateral epicondyle which was not exposed to laser radiation therein [9]. In the present study, in order to perform a more precise laser therapy, the direct radiation on the lateral epicondyle was carried out and the origin of the wrist's extensor muscles were considered in the elbow region, because the source of the inflammation and pain is located on the same region. It was found out that low-power laser therapy makes significant differences in comparison to pre-treatment in terms of the pain.

Vasseljen (1992) in a study, dealt with the comparison of the effects of low-power laser therapy and common treatment methods (ultrasound and friction massage) on the treatment outcomes in patients with tennis elbow disorder. The study well justified the positive effect of low-power laser therapy on the reduction of pain. Of course, the difference in the outcomes of these two methods was not proved statistically significant, but it could be concluded that the use of low-power laser therapy,

with a dosage of 3.5 Jules per every square centimeter, alone can reduce the pain, and if it was accompanied by the other common physiotherapy methods, the results would be more optimal [10]. The dosage applied in the current paper, 8 Jules per cm^2, has been higher than the dosage used by Vasseljen's study. Summing the results of these two research paper, it could be concluded that low-power laser therapy and common physiotherapy treatment methods could both reduce the pain, and in order to be more effective, it is better to use laser therapy alongside with the other exercises considering the other modalities of the treatment program for the patients with tennis elbow syndrome to take advantage of their effects on the reduction of pain.

In the study performed by Krasheninnikoff et al. (1994), a power equal to 3.5 Jules was applied in every point, and the wavelength used was 830 nm, and there was not seen any difference in pain reduction in contrast to placebo low level laser [11]. Possibly, this lack of ineffectiveness of the low-power laser therapy in the foresaid research paper has been due to the use of low energy per every cm^2 , so the present study made use of a higher dosage, 8 Jules per cm^2, for the same reason.

Stergioulas (2007) dealt with the comparison of the effects of low-power and placebo (with exercise) laser therapy methods on the pain intensities of the patients with tennis elbow syndrome; a dosage equal to 2.4 Jules per every cm^2 , and a wavelength of 904 nm was applied for the active laser group for a period of 12 sessions and it was reported that low-power laser along with exercise can be followed by better pain reduction results [13]. In the study undertaken by Stergioulas, the use of a laser with a proper wavelength (high penetration depth) for long sessions (12 sessions) and with follow-up examinations as well as larger study sample volume (n=50) and application of placebo laser in a control group have all served the study results very effectively. In the current research paper, higher dosage rate was applied so that better laser effects could be acquired, and the treatment plan was practiced within ten sessions.Another difference of these two studies was the study sample volume, and as can be easily seen it was smaller in the present study as compared to the research performed by Stergioulas, and the number of sample volume in every study was inter alia the effective factors, and a limitation in the present study was the lower number of the patients with tennis elbow. The present study, as well, made an evaluation of the low-power and high-power laser therapies' effects on the pain reduction, but the results were suggestive of no significant differences.

Emanet (2010) investigated laser therapy effect on 50 patients during 15 sessions (two groups of active low-power laser therapy and placebo laser), and the pain before and after the termination of the treatment and after 12 months was estimated. The evaluations were not suggestive of a significant difference between the two groups after the termination of therapy sessions, but the follow-up examinations, after 12 months since the termination of the treatment sessions, were indicative of a significant difference, and Emanet reported that low-power laser exhibited effects in long-term [14]. Based on Emanet's findings, it can be claimed that in laser therapy, which has applied the appropriate dosage, no short-term effectiveness was observed, significant differences might come along in follow-up periods after the termination of the treatment. The current research paper did not have the chance for running the follow-up tests, and the evaluations presented herein solely belonged to the period immediately after the termination of the treatment plan.

Dundar et al., (2015) dealt with the comparison of high-power laser therapy and brace in patients with tennis elbow disorder. Three treatment groups were subjected to high-power laser, and a placebo group was also designed by making use of brace treatment method, and the pain was evaluated before the treatment; after the follow up of a period of 4 and 12 weeks after the termination of the treatment plan, no significant difference was found between the high-power laser therapy and brace method, and it was concluded that high power laser therapy (and brace method) was effective on the reduction of pain in patients with tennis elbow [3]. The laser used in the study by [3] was a high-dosage laser with a wavelength equal to 1064 nm, and a mean power of 10.5 W and a peak power of 3 kW as well as a pulse length in a range from 120 ms to 150 ms, and an energy level of 1275 Jules and an energy density ranging from 360 mJ to 1780 mJ per every cm^2. The substantial difference between the laser used by [3] and the high-power laser applied in the current research paper were the device parameters among which wavelength, peak and mean power, energy and the applied super pulse state could be pointed out; the current study made use of a wavelength equal to 808 nm, but the laser penetration depth was higher, 1064 nm, in their study; the mean power of the laser in the current study was 3.3 W, and the peak power used in the study by [3] was 10.5 W. In the current research paper, the device had been set on a continuous mode, but the study carried out by [3] used the super pulse state in which a very high level of energy was radiated within a short period of time. It can be understood from the study performed by [3] that if the present study had applied a high-power laser featuring higher wavelengths as well as higher mean power and energy, then it could have possibly created significant differences in the results obtained from the comparison of high-power and low-power laser therapies; the power and the other parameters should have also been taken into consideration appropriately, and it was better to make use of high-power lasers with higher wavelengths and higher powers in the future studies so as to gain far more optimal results.

In the current research paper, a comparison of the average pain before and after the laser therapy was carried out based on the visual assessment of the pain, and it was found out that the pain intensity was reduced from 7.06 to 5.50 in the low-power laser therapy group, and also from 7.66 to 5.26 in the high-power laser therapy method, that is to say that the pain was reduced by 1.56 units in the low-power group and by 2.4 units in the high-power laser therapy group. Of course, the differences in pain reduction between the two groups were not found statistically significant, but the high-power laser therapy group showed a greater decrease in pain and it was highly likely that the results could reach significance in larger study sample volumes, and if high-power laser therapy was applied in higher power rates, there was the possibility of gaining far better results.

The Effect of Low-Power and High-Power Laser Therapies on tenderness:

Through descending the inflammation trend, elevating the healing rate and facilitating collagen-building, laser could lead to the reduction in the tenderness of the affected region [8].

In the majority of the studies performed in regard of the effect of laser therapy on tennis elbow disorder including pain when performing clinical tests and at rest times as well as grip force, questionnaires of various types have been administered and the results extracted from them have been subjected to various evaluations and the tenderness which was considered as a variable in the current study was less frequently taken into account.

Stergioulas (2007), in comparing the effect of low-power laser therapy (2.4 Jules per every cm^2 and with a wavelength equal to 904 nm) along with common exercises and placebo laser therapy along with exercises, evaluated tenderness, and a significant difference was found between the two groups, therefore it was reported that the low-power laser therapy plus the use of common exercises presented better effects on the reduction of tenderness [13]. The use of laser with appropriate wavelength (high penetration depth) for a long period (12 sessions) and follow-up evaluations as well as larger sample volumes (50 patients) and having a group which received placebo laser was a very effective factor in the study results. The current research paper made use of higher dosage of laser to acquire better results but the study was conducted in 10 sessions which was another difference between the two aforementioned studies and as could be readily seen, the present study has made use of a lower number of subjects in the study sample volume in respect to the study conducted by Stergioulas, and this could be a factor highly influencing the results. Such a limitation in the present study was due to the fewer number of the patients with tennis elbow syndrome.

In a limited number of studies carried out in this regard, the effect of high-power laser on the tenderness of tennis elbow has been neglected.

In the current study, the average tenderness rate was found decreased from -9.22 to -11.21 in the low-power laser therapy group, and from -6.35 to -10.49 in the high power laser therapy group, so it could be said that the low power laser therapy group witnessed a reduction by 1.99 units in tenderness which was about 4.14 units in the high power laser therapy group. Of course, the difference did not reach to a significance level in the current research paper, but it could be figured out that the effect of high power laser was more robust in reducing the tenderness, and more promising results could be obtained with larger sample volumes.

The Effects of High-Power and Low-Power Laser Therapies on Grip Force:

Grip force has been enumerated as one of the most important variables in tennis elbow disorder in such a manner that the majority of the patients with the disease report decrease in Grip force as well as in their power for pressing the objects [3].

Laser has been effective on ATP production, the increase in tissue repair and collagen-building, and these cellular changes have been among the important clinical advantages of laser [8] that, altogether, resulted in the enhancement of the individuals' performance in daily activities.

In the study carried out by Haker et al, (1990), low-power laser was applied in acupuncture points on the elbow, and no positive results were observed in the form of increase in Grip force [9] which could be due to the lack of a proper selection of laser radiation spot because the major tendon that is affected in tennis elbow syndrome is connected to the lateral epicondyle and the cellular effects of laser that can lead to the increase in ATP and Collagen production as well, the facilitation of the healing process (so that the patient can be enabled to more powerfully press the dynamometer device) occur in the spot under laser radiation [8]. In the current research paper, direct radiation was applied on the lateral epicondyle, and the origin of muscles of wrist' extensors in the elbow and an enhancement in the grip force were observed in low-power laser group in contrast to the results of their first session.

Vasseljen (1992) in his study dealt with the comparison of the low-power laser and common treatment (ultrasound and friction massage) methods on the grip force of the objects. The positive effect of low-power laser on the increase in grip force was proved. Of course, the difference between these effects was not found significant in contrast to the common treatments but it could be concluded that the use of low-power laser alone with a dosage of 3.5 Jules per every square centimeter could enhance the grip force, and if it was accompanied by common physiotherapy treatments then far more optimal results could be obtained [10]. The dosage used in the present study was higher than the dosage of laser used in the study by Vasseljen (1992) (8 Jules/cm^2), and a significant difference was found in low-power laser therapy group after the treatment in the grip force. Summing these two latter studies, it could be concluded that low-power laser therapy and common treatments both were capable of enhancing the grip force, and in order to gain higher efficiency, it was better to make use of laser alongside with the other exercises and modalities in the treatment programs of the patients with tennis elbow, and their effects could be applied to increase the healing trend and grip force.

Stergioulas (2007) dealt with the comparison of the effects of low-power laser therapy (active laser with a dosage of 2.4 Jules/cm^2 and a wavelength of 904 nm in 12 sessions) along with the common exercises, and the effect of placebo laser therapy along with common exercises; one of the variables evaluated by him was the grip force, and the results were reflective of a significant difference between the two groups, therefore it was reported that low-power laser alongside with the common exercises had better effects on the grip force [13]. In the study carried out by Stergioulas, the use of a laser with appropriate wavelength (high penetration depth) for a long period of time (12 sessions) and follow-up examinations as well as larger study sample volume (50 patients) and the use of placebo laser for a separate group have all been the effective factors contributing to the significance of the results. In the current study, a higher dosage of laser was applied for the attainment of better results, and the study subjects were subjected to the treatment plan for a period of ten sessions. Another

difference between these two latter studies has been the study sample volume which has been smaller in the current study as compared to the study by Stergioulas, and this latter factor has been the most influential factor on the results. The constraint has been due to the fewer number of the patients with tennis elbow; however, significant difference was found in grip force of the patients after the termination of the treatment plan.

Emanet (2010) investigated laser therapy on 50 patients for a period of 15 sessions (the two active low-power and placebo laser therapy groups). The variable "grip force" was evaluated before and after the termination of treatment as well as after 12 months since the termination of the treatment plan. There was not found any significant difference between the two groups immediately after the termination of the treatment sessions; but the follow-up evaluations after a period of 12 months since the termination of the treatment plan demonstrated significant differences, and it was reported by Emanet that low-power laser therapy revealed its effects in long term and with no side effects [14]. According to what has been found by Emanet, it could be claimed that, it was highly probable in a study that has used appropriate dosage and has not resulted in positive results in short term to finally find significant differences in a follow-up period after the termination of the treatment plan. The current research paper did not have the time for follow-up examinations, and the results presented herein belonged to the evaluations that were carried out immediately after the termination of the treatment sessions, and an enhancement in the grip force of the patients who had been subjected to low-power laser therapy and common treatment methods was observed.

Dundar et al., (2015) in a study dealt with the comparison of the effects of high-power laser therapy and brace treatment methods in patients with tennis elbow. Three treatment groups receiving high-power laser, brace and placebo laser were designed, and the grip force was evaluated before and after the treatment as well as after 4 months and 12 months since the termination of the treatment sessions. No significant difference was found between the high-power laser therapy group and the brace group. It was concluded that the high-power laser (and brace) was effective on the enhancement of grip force in patients with tennis elbow [3]. The laser used in the study by [3] was a high-power laser which was substantially different from the high-power laser used herein. Wavelength, peak and mean power rates, energy density and radiation mode were among the differences; the present study used a wavelength equal to 808 nm, and it could be surely stated that the laser's penetration depth has been definitely larger, 1064 nm, and this could cause an increase in the cellular effects in favor of the tissue healing [8]. The mean power used herein was 3.3 W which was 10.5 W in the study by [3]. Also, the laser used in their study has been of the super pulse laser type that produced a higher level of energy within a shorter period of time, whereas the present study made use of a lower energy level in a continuous mode on the elbows. This latter difference could directly influence the study results. It could be figured out from the study by [3] that if the present study made use of a high-power laser with larger wavelength, then a higher mean power and energy could be exerted so more significant results could be acquired in grip force of the patients in contrast to the low-power laser therapy because the blood circulation and, subsequently, the healing of the tendons could be elevated with the increase in laser's penetration depth and energy [8], and finally patients' grip force would increase. Therefore, the inability to acquire more significant differences in the comparison between the two laser therapy methods has been more likely due to the power and the other abovementioned parameters, and future researchers should make use of high-power lasers with higher wavelength and power in the super pulse mode so that greater effectiveness can be attained.

In the present study, the average grip force was increased from 15.46 to 19.26 in the low-power laser therapy group which was from 16.86 to 22.20 for the high-power laser therapy group. Therefore, it can be stated that the grip force of the patients in the low-power laser therapy has increased for 3.8 units in contrast to 5.34 units for the high-power laser therapy group. Thus, though the findings did not reach a significance level herein, an enhancement in the high-power laser therapy group was well-justified and the use of larger sample volumes and high-power laser therapy featuring higher power and wavelength might most likely make more significant differences in the future research studies.

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