

Effect of Laser Therapy on Flexor Tendinitis in Diabetic Hand

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ABSTRACT

The purpose of this study was to assess the effect of laser therapy (infrared laser) on hand pain due to flexor tendinitis in diabetic patients and its relative effect on hand grip power and pinch power has been investigated. Fourty diabetic patients (25 males and 15 females) represented the sample of this study. Their age ranged from 50 – 60 years. They were randomly divided into tow groups equally in number (I and II). Patients in group (I) received infrared laser for 15 minutes with frequency of 700 Hz from medical laser applied on affected hand every other day for 12 sessions. While group (II), receive placebo laser therapy for the same duration of treatment sessions. The hand grip power was evaluated using a hand grip dynamometer and pinch grip power by using a pinchmeter, while the assessment of pain sesation using, visual analogue pain scale (VAS). Evaluation for each individual was done before and after treatment. The results of this study suggested that application of laser therapy lead to significant improvement in hand grip power and pinch grip power due to decreased pain.

INTRODUCTION

Diabetes mellitus is a syndrome characterized by disturbance of metabolism of carbohydrate, protein, fat and vitamins due to absolute or relative deficiency of insulin with or without microvascular complications¹. As result of diabetic neuropathy, there may be atrophy and weakness of hand muscles in the distribution of the ulnar and median nerve^{2,3}. The prevalence of hand abnormalities and function was significantly decreased in diabetic patients⁴. The hand grip is one of the most important function of the hand in the daily living activity¹⁰. Physical treatment in the form of laser therapy is recommended for chronic soft tissue inflammation and relief of

pain and muscle spasm^{3,7,9}. The efficacy of laser for the pain relief has been investigated in a range of conditions, principally rheumatoid arthritis, osteoarthritis, periarthritis, musculoskeletal pain, and sport injuries, neuropathic and neurogenic pain, and operative and postoperative pain. Therapeutic laser is at least comparable, if not actually superior to a number of other electrotherapeutic agents including interferential therapy and short wave diathermy for analgesic effect⁴. Low level therapeutic laser (light amplification by stimulation emission of radiation) has been reported to be a useful alternative to drug therapy in pain management and in facilitation of rapid return to function status⁵. In human being laser has an effect in reducing

pain^{12,16,20}. There are three unique properties of laser together are able to cause responses in living tissue. There are collimation, coherence and monochromatically^{14,18}. Perpendicular contact application of the laser probe to the skin surface during irradiation will enhance penetration depth by reducing reflection and scatter¹¹. The depth of light penetration can be enhanced by a little compression of the tissue. Penetration depth might also be affected by the size of the beam¹⁵.

The treatment must begun with the minimal dose that will achieve a therapeutic response and in case of unsuccessful results we have increase the intensity gradually until the best response. The photobiologic effects of stimulation depend on the wavelengths, dose and intensity of the light¹⁷. The mechanisms of laser biostimulation analgesic and wound healing include activation of vessels to induce fibrinolysis or increase of phagocytosis resulting in restoration of a normal physiologic state⁵.

The aim of this study was to investigate the effect of laser therapy on flexor tendinitis in diabetic hand.

PATIENT, MATERIALS AND METHODS

Patients

Fourty diabetic patients with bilateral flexor tendinitis 25 males and 15 females with an age ranging from 50 60 years represented the sample of this study . They were selected from the out patient clinic of Om Elmasryien, General Hospital. They-were assigned randomly into two groups equally in number (I) and (II). Group (I) twenty patient (13 males - 7 females) their age ranged from 50 55 years. They received 3 sessions of infra-red laser per week for 4 weeks as a total treatment period, applied to the affected tendon. Group

(II) twenty patients (12 males - 8 females) their age ranged from 52 60 years received placebo laser therapy for the same duration, as in group (I).

Materials

ASA medical laser (ida), with frequency of 700 Hz program 27 was used. It is considered not a visible light laser which penetrate very deeply (3mm). It is manufactured by a medical company in Italy.

Methods

I- Evaluation: The patient was kept in a relaxed setting position with supported back and will supported position for both upper limb during measurement. Hand grip strength was measured hand grip dynamometer while pinch grip measured by using pinchmeter. The evaluation of pain was carried out by using visual analogue scale. The pre and post laser therapy changes in handgrip and pinch grip were evaluated for every patient and statistically analysis. Comparative statistics will be used to test the difference between the two group (study group and control group).

II- Treatment: group (I) patients was received infrared laser for 15 minutes with frequency of 700 Hz, applied to the tendon of the affected hand every day for 12 session. Patient of group (II) received placebo laser therapy for the same duration of treatment sessions.

RESULTS

Results of hand grip

As shown in table (1) and figure (1) The mean values of hand grip strength in (Kgs) before and after treatment in group I were 11.7 ± 4.9 Kgs and 15.7 ± 4.7 Kgs respectively,

with percent of relative changes 34.19%, which was being statistically significant ($P < 0.001$).

In group II mean values before and after treatment were 14.01 ± 6.05 Kgs and 14.07 ± 6.0 Kgs respectively, with percentage of change 0.43 %, which was being statistically in-significant ($P < 0.05$).

Results of pinch grip

As shown in table (2) and figure (2) the mean values of pinch grip in (Kgs) for group I were 2.5 ± 1.6 Kgs and 4.4 ± 1.4 Kgs respectively, with percent of relative change 76 %, which was being statistically significant ($P < 0.001$).

In group II mean values before and after treatment were 2 ± 1.6 Kgs and 2.4 ± 1.7 Kgs

respectively, with percentage of change 20 %, which was being statistically significant ($P < 0.001$).

Results of pain

As shown in table (3) and figure (3) the mean values of pain in group I before and after treatment, were 7.7 ± 1.6 and 3.1 ± 1.1 respectively, with percent of relative change 59.74%, which was being statistically significant ($P < 0.001$).

In group (II) the mean values before and after treatment were 6.7 ± 1.6 and 7.1 ± 1.2 respectively, with percent of relative change 0.43%, which was being statistically significant ($P < 0.001$).

Table (1): The mean values, and percentage of relative changes of hand grip strength in (Kgs) before and after treatment in both groups.

Groups	Before Mean S.D	After Mean S.D	%of relative changes
Group I	11.7 ± 4.9	15.7 ± 4.7	34.19
Group II	14.01 ± 6.05	14.07 ± 6.07	0.43

*Percentage of relative changes was significantly higher in group (I) more than group (II) ($P < 0.001$).

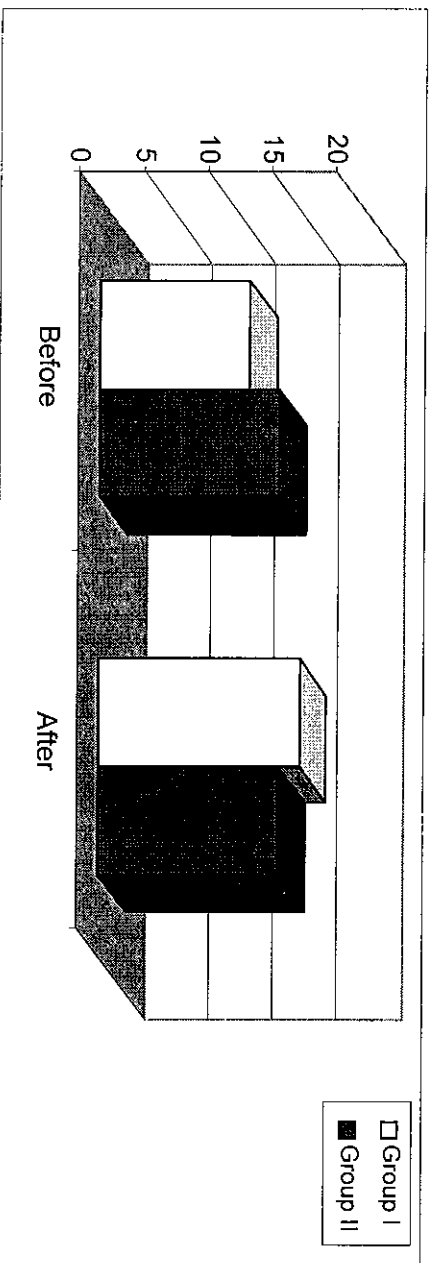


Fig. (1): The mean values, and percentage of relative changes of hand grip strength in (Kgs) before and after treatment in both groups.

Table (2): The mean values, and percentage of relative changes of pinch grip strength in (Kgs) before and after treatment in both groups.

Groups	Before Mean S.D	After Mean S.D	% of relative changes
Group I	2.5 ± 1.6	4.4 ± 1.4	76*
Group II	2 ± 1.6	2.4 ± 1.7	20

* Percentage of relative changes is significantly higher in group I more than group II (P < 0.001).

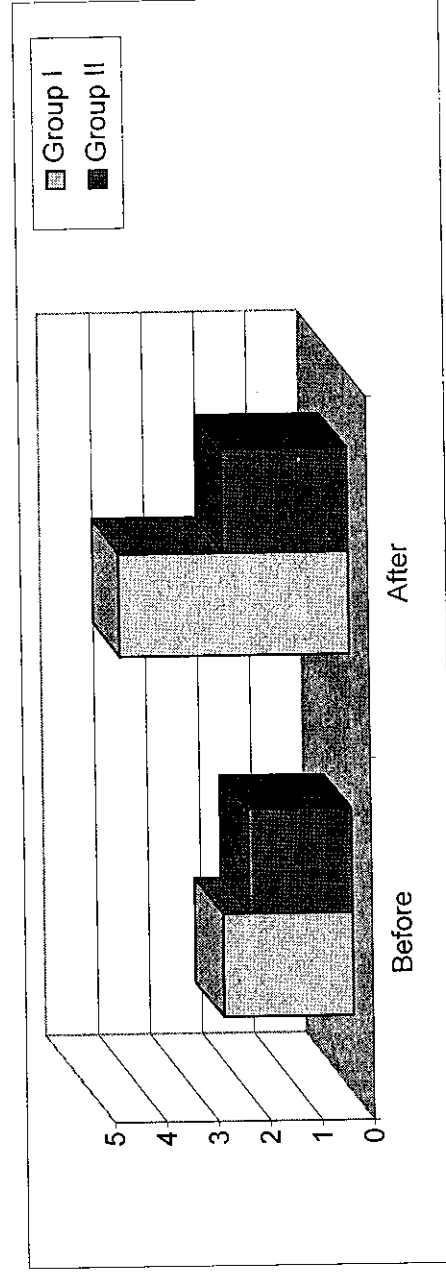


Fig. (2): The mean values, and percentage of relative changes of pinch grip strength in (Kgs) before and after treatment in both groups .

Table (3): The mean values, and percent of relative changes of pain sensation before and after treatment in both groups .

Groups	Before ± Mean S.D	After ± Mean S.D	% of relative changes
Group I	7.7 ± 1.6	3.1 ± 1.1	59.74
Group II	6.7 ± 1.6	7.1 ± 1.2	0.43

* Percent of relative changes is significant improvement of pain group (I) more than group (II) (P < 0.001).

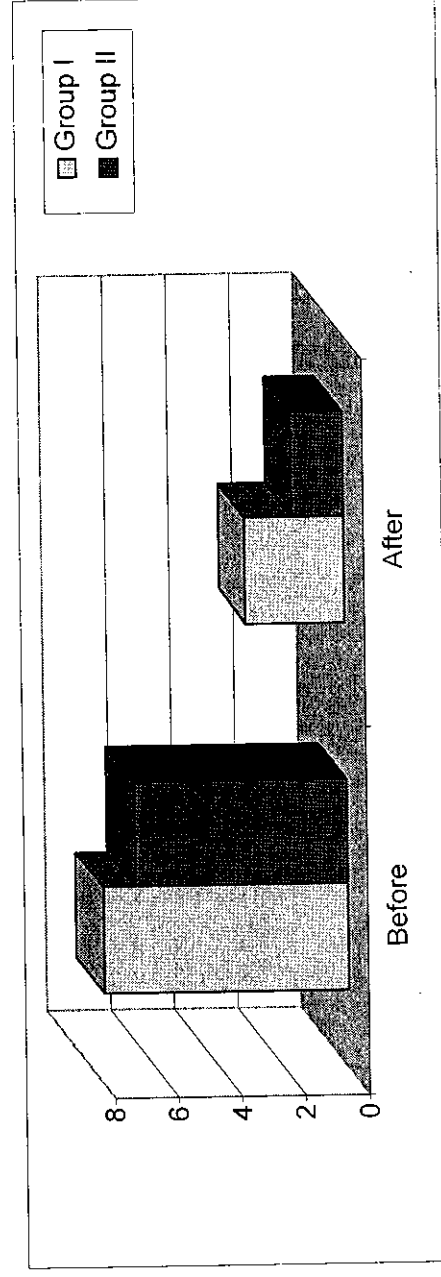


Fig. (3): The mean values, and percentage of relative changes of pain.

DISCUSSION

The effect of twelve sessions of laser therapy for tendinitis of hand flexors was studied on forty diabetic patients. They were randomly subdivided into two groups (I, II) equally in number. Group I received infrared laser at trigger points of the hand group II received placebo laser therapy for the same duration of treatment. The hand grip dynamometer was used to evaluate the hand grip power and pinch meter to evaluate the pinch grip strength, while the pain sensation was evaluated by visual analogue pain scale.

The results of this study was significantly improved in group I only. Comparing the results of research studies of different investigators, it was concluded that the result of this study agree with them due to decrease of pain as result of laser application.

Mackler, et al., (1989), reported that using of laser therapy in a patient with trigger points allowed gradual complementary improvement. The result of this study coincides with our results in the recording of pain sensation.

Walker J. b. (1983), reported that chronic pain is significant reduced after laser therapy 12 sessions of treatment. The results come in agreement with the results of the present study.

Grethouse, et al., (1985). Stated that, the same application of laser therapy and showed significant improvement in their results¹¹. Also, Carolyn, et al., (1990). Reported that, laser therapy compared to control group was investigated, in which more reduction in pain was recorded in the laser group than control group.

Cashova et al., (1991). reported significant improvement in hand grip after 6 weeks treatment with laser therapy. While, Franz (1992), recommended the use of a laser

therapy with moderator exercises for 12 sessions it lead to increased hand grip strength. Effect of laser irradiation of musculoskeletal trigger points with cold laser increase skin resistance and reduce pain that minimal tissue healing occurs with the cold laser walker et al, (1989), reported that, there are numerous disease for which laser treatment is recommended, articular distortions, tendinitis, periarthritis, lumbo-sacatic pain. The pain disappear very early permitting rapid functional recovery. England et al (1986) reported that the treatment with the infrared laser system results in significant improvement in pain and movement in case of tendinitis.

CONCLUSION

The present study confirmed that, hand grip, pinch grip sensation of the diabetic flexor tendinitis in hand for patients could be effectively increased when treated with laser therapy after 12 sessions which applied to the pain zone (trigger point) as a result of decreasing pain sensation.

REFERENCES

- 1- Andrea, S.; David, B.; Deirdre, M. and Janes, M.: Effect of low intensity laser (850 nm) irritation on skin temperature and antidromic conduction latencies in the human median nerve. *Relevance of radiant exposure. american J. laser in surgery and medicine*, 14: 40-46, 1994.
- 2- Badr, N.M.: The ability of diabetic muscle to develop. Thesis. Cairo University. P86-89, 1982.
- 3- Balboni, G.; Chrondi, M.L. and Repice, F.: Effect of laser irritation of two lines of normal human fibroblasts in vitro, *International congress on laser in medicine*. June 26 - 28: 101-103, 1985.

- 4- Baxter, G.; David, D. ; Costas, O. and Shields, T.: Therapeutic laser theory and practice living stone. London, Madrid. Newyork and Tokyo. P 23-48, 1998.
- 5- Carolyn, E.; Cheryi, J. and James, R.: Effect of He-Ne laser, Auricular therapy on experimental pain threshold. Physical therapy J. Vol. 70 No. 1 January, 1990.
- 6- Casanova, J.E.; Casanova J.S. and Young, M.J.: Hand function in patients with diabetes mellitus "south. Med. J. Vol. 184 No. 9 p. 1111-1113 (abstract), 1991.
- 7- England, S.M.; Copack, J.S. and Bacon, B.A.: "An observer blind trial of I.R. ce. mid. Laser therapy in bicipital and superaspinatus tendonitis" international congress on laser in medicin and surgery, Bologna June, 26-28, 1986.
- 8- Franz, M.J.: "Exercise and diabetic" in management of diabetes mellitus, Debra Haire, Joshu, London Boston. P 80-117, 1992.
- 9- Frederic, J.; Keith, G. and Jastus, F.R. : "Krusen,s Handbook of physical medicin and rehabilitation, 7 the edition, W.B sandres company, P24-25, 1990.
- 10- Gamstedt, A.; Glad, j.; Ohlson, C.G. and sundstrom, M.: Hand abonormalities are strongly associated with the duration of Diabetes mellitus "Journal of internal Medicine Vol. 234 P. 189-193 1993.
- 11- Grethouse, D.; Currier, D. and Gilmore, R.: Effect of clinical infra red laser on superficial radial nerve conduction physical therapy 65:1194-1187, 1985.
- 12- Hasson, T.L. and Obont: Infrared in the treatment of cranio-mandibular disorders, arthrogenius, pain, dent, 61:614-617, 1989.
- 13- Jaan, M.C. and Barry, S.: perceptions of the clinical efficacy of laser therapy. Australian physiotherapy J. vol. No. 2, 101-105, 1993.
- 14- Jeffery, R.: low intensity laser still not an established clinical tool, lasers in surgery and medicine 16:331-342, Wiley-Liss, INC, 1995.
- 15- Keijzar, M.; Jacques, S.L.; Prahi, S.A. and Welch, A.H.: "Light distribution in artery tissue: Monte carlo stimulation for finite, disamerter laser beams" laser in surgery and medicine 9, 148 154, 1989.
- 16- King, C.E.; Clelland, J.A.; Knowles, C.J. and Jakson, J.R.: "Effect of He Ne laser Auriculopathy on experimental paint threshold" Am. Phys. The. 7.70 (1) 24-30, 1990.
- 17- Laakso, L.; Richardson, S. and Cramond, T.: Quality of light is laser necessary for effective photobiostimulation? Australian physiotherapy J. Vol. 39. No. 2, 87-92, 1993a.
- 18- Laasko, L.; Richardson, C. and Cramond, T.: Factors affecting low level laser therapy. Australian J. of Ph. Th. Vol 39.No. 2 95-99, 1993b.
- 19- Macher, L.S.; Barry, A.J.; Perkins, A.I. and Arcek, M.O.: Effect of He-Ne laser irritation on skin resistance and pain in patients with trigger points in the neck : AM . Phys. Ther. J. 69(5): 336-341, 1989.
- 20- Scudds, R.A.: Pain assessment, the Australian J. of physiotherapy. vol. 29, (3), June, 69, 102, 1983.
- 21- Walker, J.B.: "relief for chronic pain by low power laser irritation" Neuroscilell, 43. 339-344, 1983.

المؤلف العربي

تأثير أشعة الليزر العلاجية على التهاب اوتار الكفي للمريض بالحوال السكرى

إن مرضى السول السكرى يعانون من ضعف فى عضلات اليدين ، وبصاحب هذا الضعف الإم فى اليد و التهاب فى أوتار الكفي لأصابع اليد ، ولذلك كان من الضرورى دراسة وبحث هذه المشكلة ، وقد استخدمت أشعة الليزر فى علاج هذا الالتهاب الذى يحدث فى اليد والكفي يؤثر فى الحركة اليومية للمريض مما يسبب ضعف أكثر فى اليد ، وقد أجريت هذه التجربة على 40 مريض تم اختيارهم عشوائيا من العيادة الخارجية بمستشفى أم المصريين تتراوح أعمارهم بين 50-60 سنة ، وقد تم تقسيمهم إلى مجموعتين متساويتين عدد كل منهم 20 مريض ، المجموعة الأولى عولجت بأشعة الليزر لمدة 12 جلسة بواقع 3 جلسات أسبوعيا لمدة 15 دقيقة وتردد قده 700 نبضة / ثانية ، وهذا من وقع البرنامج المسجل على الجهاز المستخدم فى الدراسة ، والمجموعة الثانية عولجت بالتأثير المخادج لأشعة الليزر . وقد تم قياس قوة اليد باستخدام الديناموميتر الأكترونى بالكيلو جرام وقياس شدة الألم باستخدام سؤال المريض عن شدة الألم . ومن خلاصة هذه التجربة لوحظ أن استخدام أشعة الليزر لمدة 15 دقيقة قد حسن الحالة المرضية للمريض وجعل المريض يودى العمل اليومي بدون ألم وبذلك زادت قوة قبضة اليد لمريض البول السكرى .