Effectiveness of muscle stretching exercises with and without laser therapy at tender points for patients with fibromyalgia

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Abstract

Objective

To assess the efficiency of a treatment composed of muscle stretching exercises, associated or not to laser therapy at tender points, for patients with fibromyalgia (FM), in view of bettering their quality of life.

Methods

Twenty FM patients were randomly assigned to two groups: one submitted to laser therapy and stretching (LSG, n = 10), and the other only to stretching exercises (SG, n = 10). The visual analog scale of pain (VAS) and dolorimetry at tender points were used to assess pain; life quality was evaluated by means of the Fibromyalgia Impact Questionnaire (FIQ) and the 36-item Short-Form Health Survey (SF-36).

Results

After the treatment program, both in LSG and SG were detected pain reduction, higher pain threshold at tender points (all $p < 0.01$), lower mean FIQ scores, and higher SF-36 mean scores (all $p < 0.05$). No significant differences were found between both groups.

Conclusion

The stretching exercises program proposed is efficient to reduce pain and painful sensibility at tender points, thus enhancing patients' quality of life. Laser therapy has not shown advantages when added to muscle stretching exercises.

Key words

Fibromyalgia, exercise, low-level laser therapy, quality of life.

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Introduction

Considering the chronic diseases, the role of health assistance in improving people's quality of life has been increasingly underlined, mainly concerning pain and suffering relief (1). Fibromyalgia (FM) is a syndrome of diffuse and chronic pain, categorized by the presence of widespread pain plus tenderness at at least 11 out of 18 specific points (tender points) sensitive to touch (2). The latter classification criteria (2) are often associated with other symptoms, such as anxiety, depression, sleep disturbance, and stiffness. However, the main FM symptom is diffuse and chronic pain. Sometimes it is so intense that it interferes in a person's job, daily-life activities and quality of life (3-5).

Physical therapy plays an important role in reducing FM symptoms (6-7), thus contributing to improve patients' quality of life (7). Programs of physical exercises have shown beneficial results (8). Also, low-power laser has been largely used and researched, mainly in connection with its analgesic properties (9-13).

Due to the chronic aspect of fibromyalgia and the constant presence of the symptoms, there is an urgency to find effective treatment aimed at minimizing the impact of FM on patients' life. It is believed that muscle stretching can bring benefits by improving the musculoskeletal function (14). As these patients usually show a low pain threshold at tender points, the use of local analgesia at these points could also benefit them. Thus, the aim of this study was to evaluate the effectiveness of a physical therapeutic treatment composed of muscle stretching exercises and laser therapy at tender points in improving the quality of life of patients with FM.

Materials and methods

Subjects

Twenty-five subjects diagnosed as fibromyalgic patients (2) were originally selected from the Rheumatology Outpatient Department of the Hospital das Clínicas of the University of São Paulo School of Medicine (HCFMUSP). The criteria for inclusion were age between 25 and 60 years old and having enough cognitive level to understand the procedures and follow the basic orientations given; subjects with a history or suspicion of neoplasia were excluded(15).

Subjects were randomly distributed into one of two groups as they were referred to physical therapy: laser and stretching group (LSG) and stretching group (SG). This study was approved by the Ethics Committee for the Analysis of Research Projects of the Clinical Management of HCFMUSP. Patients were attended to at the physical therapy section of the Rheumatology Outpatient Department of HCFMUSP. Out of the 25 selected patients, 5 abandoned the treatment before it ended, hence this study refers to 20 subjects, 10 in each group.

Materials

The following were used: evaluation protocol; dolorimeter (Pain Diagnostics and Thermography, Great Neck, NY, USA, surface of pressure application 1 cm^2); black dermatographic pencil (Dermatograph, Mitsubishi 7600, Japan); low-power laser apparatus (GaAlAs, 830nm, average power 30mW, Laserpulse, IBRAMED Ltd., São Paulo, Brazil), checked by the Optical Laboratory, Division of Mechanics and Electricity, Institute of Technological Research of the State of São Paulo – IPT; and instruction book.

Procedures

Evaluation: after being included in the study, all subjects were submitted to two evaluations, one at the beginning and the other at the end of the treatment. The evaluation protocol included: (i) anamnesis; (ii) Visual Analog Scale of Pain (VAS)(16), by which the patient informs the intensity of pain he or she is feeling; the higher the score the higher the pain intensity; (iii) dolorimetry of pain threshold at the 18 tender points (4, 17) in which a pressure is applied to a point until the patient reports pain; the lower the score, the higher the pain sensitivity; (iv) the Fibromyalgia Impact Questionnaire (FIQ) (18, 19), which evaluates the impact of FM on daily life; the higher the score, the higher the impact of fibromyalgia, hence a poorer quality of life; (v) the Medical Outcomes Study 36-item

Short-Form Health Survey (SF-36)(20, 21), which is a health-related quality-of-life questionnaire with 36 questions divided among eight domains; the score for each domain varies from zero to a hundred, the latter being the score that corresponds to best quality of life.

Educational session

All subjects, regardless of the groups they had been assigned to, were individually addressed at the beginning of the treatment (immediately after the first evaluation) with information on the syndrome, in order to assure some homogeneity of knowledge about their condition. During this session, subjects were informed about the nature of FM, symptoms, treatment (emphasizing the importance of exercises) and consequences on daily life activities. Ergonomic strategies were taught, such as appropriate postures for carrying weights and to perform daily activities. Finally, a basic exercise program was taught, which was composed of five exercises for lengthening the glutei, paraspinal muscles, biceps femoris, semitendinosus, semimembranosus, pectoralis, scalenus, intercostal muscles, and trapezius. Each exercise was repeated ten times. The patients received a booklet with all the information dealt with, including illustrations of the exercises taught.

Laser therapy and stretching group

LSG subjects had 10 individual sessions each, composed of laser therapy and muscle stretching exercises, twice a week, lasting one hour each. Laser was applied at intensity of 3J/cm^2, in continuous mode, with the probe head held at a right angle to the skin at each tender point. After that, the patient would perform stretching exercises, in order to stretch scaleness, minor pectoralis, intercostals, the diaphragm, paraspinal, hamstring, glutei, triceps suralis, iliopsoas, adductors, internal rotators of the hip, trapezius, deltoid, elbow, fist and finger flexors, subscapular, major pectoralis, and coracobrachialis muscles. These exercises were taught little by little at each session, and each was repeated ten times. Patients received illustrations and descriptions of the exercises so that they might also perform them at home in between sessions.

Stretching therapy group

The subjects assigned to the SG also had 10 individual sessions, twice a week, lasting one hour each, in which the same muscle stretching exercises taught to the LSG were practiced. Patients were also advised to carry on the exercises daily at home. No laser therapy was associated.

Statistical analysis

Comparison between initial and final measures within each group was made using the T-test for paired means. Differences of each variable between the groups were verified through the one-way single factor variance analysis (ANOVA). The level of significance for the whole statistical analysis was set at $p = 0.05$.

Results

Basic data on the 20 subjects are presented in Table I. Mean age in both groups was similar, with no significant differences between them. All patients were female.

Pain measures – obtained by means of the VAS and of dolorimetry at tender points – for the two groups are shown in Table II, comparing initial and final evaluations. Both LSG and SG subjects reported less pain at VAS after the treatment ($p = 0.006$ and $p = 0.002$, respectively) and shown increase in the pain threshold at the tender points ($p = 0.001$ and $p = 0.007$, respectively).

Both groups who received treatment – LSG and SG – showed statistically significant lower FIQ mean scores ($p = 0.039$ and $p = 0.006$, respectively) after treatment (Table III).

Table IV shows data obtained by the SF-36. Mean scores for both LSG and SG were significantly higher ($p = 0.001$ and $p = 0.000$, respectively).

Comparison between groups

Figure 1 shows comparison between the groups concerning pain as measured by the VAS. Most LSG and SG

Table I. Social-demographic and clinical features of patients with FM per group.

Features	LSG (n = 10)	SG (n = 10)
Mean age (years) (min-max)	44 (28-60)	45 (31-57)
Sex		
Female	10	10
Male	0	0
Occupation		
Works outside home	5	5
Housewife	4	4
Unemployed	1	1
On health pension	1	0
Average BMI* (kg/m^2) (SD)	25.9 (4.7)	26.5 (5.4)
Pain modulation**		
Physical effort	9	4
Anxiety	3	3
Climate change	3	2
Insomnia	1	1

*BMI = Body mass index; SD = Standard Deviation

**Factors that may increase pain; subjects might report more than one factor.

Table II. Mean (SD) VAS scores and pain threshold at tender points of patients with fibromyalgia per group.

	LSG (n = 10)			SG (n = 10)		
	Initial	Final	*p*	Initial	Final	*p*
Mean VAS scores (cm)	7.6 (2.3)	4.7 (2.9)	**0.006**	7.3 (2.1)	4.6 (1.7)	**0.002**
Mean TP threshold (kg/cm^2)	1.2 (0.3)	1.9 (0.6)	**0.001**	1.4 (0.6)	2.0 (0.8)	**0.007**

SD = Standard Deviation.

Table III. Mean (SD) scores of symptoms reported at FIQ by patients with FM per group.

	LSG (n = 10)			SG (n = 10)		
	initial	final	*p*	initial	final	*p*
Pain	7.3 (2.6)	4.7 (2.7)	0.021	7.5 (2.1)	4.7 (2.1)	0.002
Fatigue	8.0 (2.4)	4.9 (3.4)	0.008	6.3 (1.5)	2.8 (3.1)	0.002
Morning tiredness	7.3 (3.5)	4.0 (2.2)	0.016	6.7 (3.5)	3.9 (3.3)	0.009
Stiffness	7.3 (2.9)	6.2 (2.1)	0.194	6.4 (3.3)	5.5 (3.0)	0.173
Anxiety	8.0 (2.8)	7.0 (1.8)	0.139	6.1 (3.3)	4.2 (3.0)	0.036
Depression	6.5 (2.7)	7.0 (2.3)	0.681	5.0 (3.4)	3.4 (3.3)	0.066
Mean score	*7.4 (2.3)*	*5.6 (1.5)*	*0.039*	*6.3 (2.1)*	*4.1 (2.4)*	*0.006*

Table IV. Mean (SD) scores at SF-36 domains per group.

	LSG (n = 10)			SG (n = 10)		
	initial	final	*p*	initial	final	*p*
Functional capacity	38 (20.3)	54 (23.1)	0.041	44.5 (19.6)	66 (22.9)	0.004
Physical aspects	15 (26.9)	57.5 (39.2)	0.008	20 (25.8)	45 (48.3)	0.053
Pain	19 (15.2)	46.4 (17.6)	0.000	28.4 (19.2)	51.5 (15.2)	0.003
General condition	64.2 (30.4)	68 (17.7)	0.295	51.9 (31.4)	72.7 (27)	0.001
Vitality	44 (30.6)	52 (28.1)	0.164	44.5 (36.3)	62.5 (32.5)	0.078
Social aspects	31.5 (29.4)	76.3 (30.9)	0.002	52.5 (37.2)	71.3 (28.9)	0.026
Emotional aspect	49.9 (39.2)	66.7 (41.6)	0.170	63.3 (42.9)	76.6 (38.7)	0.171
Mental health	44.4 (28.7)	53.2 (26.1)	0.118	57.2 (26.4)	72.4 (27.2)	0.011
Mean score	*38.3 (17.4)*	*59.3 (17.9)*	*0.001*	*45.3 (23)*	*64.7 (18.9)*	*0.000*

subjects had VAS final scores lower than before treatment, with no significant differences between them.

Figure 2 illustrates the comparison of pain threshold (PT) values for both groups. Most LSG and SG subjects had higher PT mean scores after treatment, with no significant differences between the two groups.

Figures 3 and 4 show FIQ and SF-36 mean scores for LSG and SG subjects, again with no significant differences between them.

Discussion

The initial hypothesis was that the group of patients treated with the association of stretching exercises and laser therapy would show improvement in health-related quality of life due to reduction of pain and of painful sensibility at tender points. However, laser therapy did not produce results, since there were no significant differences between the LSG and the group treated only with stretching exercises.

Parameters of the application of laser therapy used in this study are according to most studies in the area (22-30); these have all used 830nm wave length; however, there was high variability concerning emitted power, which varied from 21mW to 120mW, and energy doses, which ranged from 0.3 to 10.8J and 3 to 12J/cm^2. The different results seem to depend mainly on two factors: the dose and the interval between sessions. According to Tuner *et al*. (29), too low doses, of 1J or less (27, 28), or too high ones (23J), as used by Johanssenn *et al*. (26), may justify the ineffectiveness of laser therapy to reduce pain.

The interval between sessions is another discussed point; in most studies with positive results laser was applied three or more times a week. But the proposed stretching program required gradual introduction of exercises after previous ones had been effective, hence the twice-weekly frequency chosen for the present study. Gür *et al*. (30) published a single-blind study evaluating the efficiency of low-power laser therapy in the treatment of FM. The authors used laser of 904nm for each tender point. Laser therapy was applied in 10 consecutive sessions, five times a week. The authors have found that both test and placebo groups obtained statistically significant lessening of symptoms, the final measures being significantly higher in the test group. A third group of patients received 10mg of amitriptyline. While both laser and drug therapies were shown to be efficacious in relieving symptoms and improving the quality of life of patients with FM, laser-treated patients have shown a more significant reduction in intensity of pain, fatigue and depression when compared to the drug therapy group.

According to Baxter (31), the wave length is a critical factor in determining therapeutic effects achieved by laser treatments, for this parameter determines which specific biomolecules will absorb the incident radiation, and therefore the photo-biological interac-

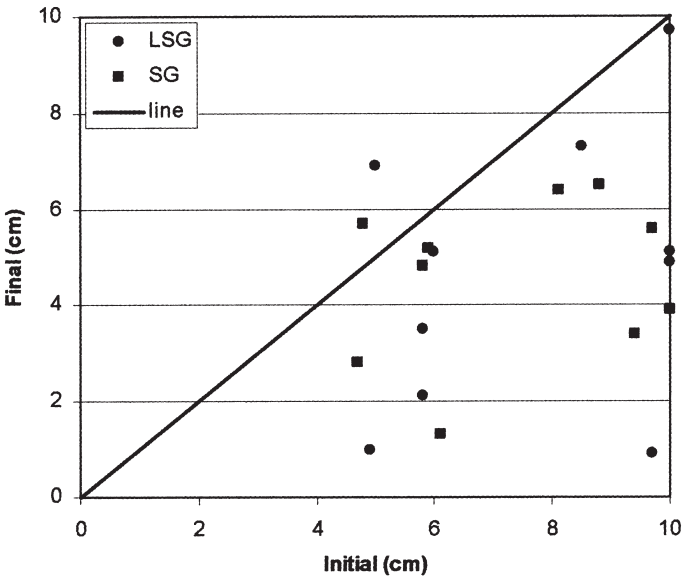

Fig. 1. Dispersion of initial and final VAS scores for subjects from both groups (n = 20) (the higher the VAS score, the greater the pain intensity). Points along the straight line indicate the same pain intensity reported before and after treatment.

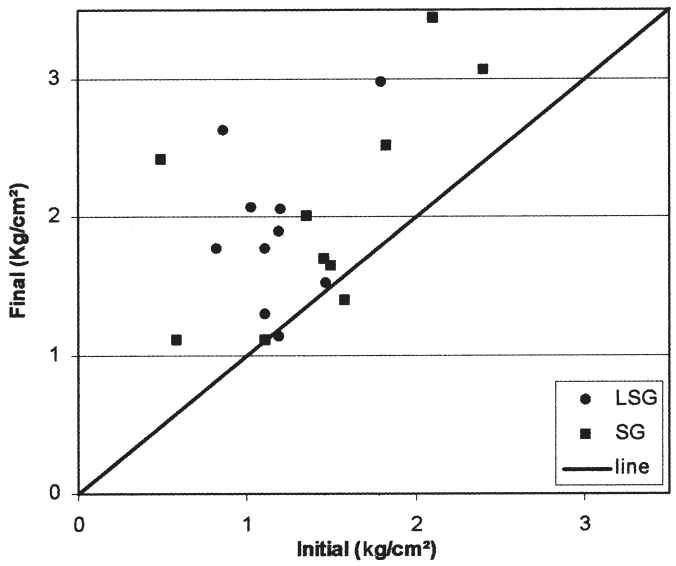

Fig. 2. Dispersion of initial and final tender points mean scores for subjects from both groups (n = 20) (the higher the score, the higher the threshold, i.e., the lesser the tenderness at tender points). Points along the straight line indicate the same tenderness before and after treatment.

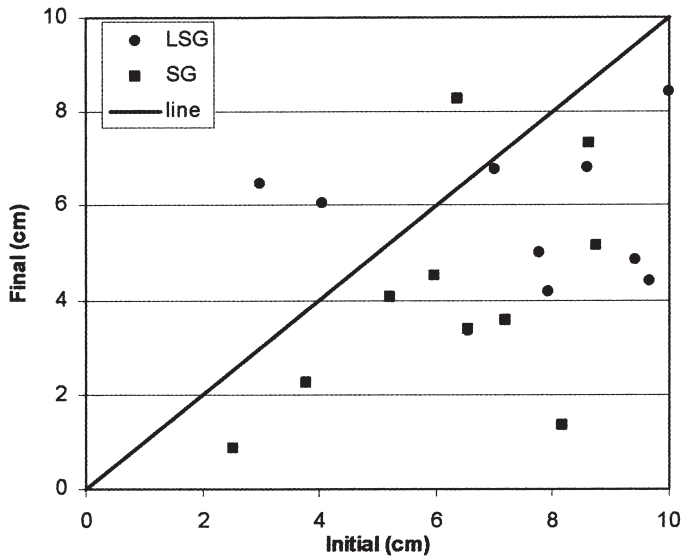

Fig 3. Dispersion of initial and final mean scores at the Fibromyalgia Impact Questionnaire (FIQ) for subjects from both groups (n = 20) (the higher the score, the higher the impact, that is, the worse the health-related quality of life). Points along the straight line indicate same scores before and after treatment.

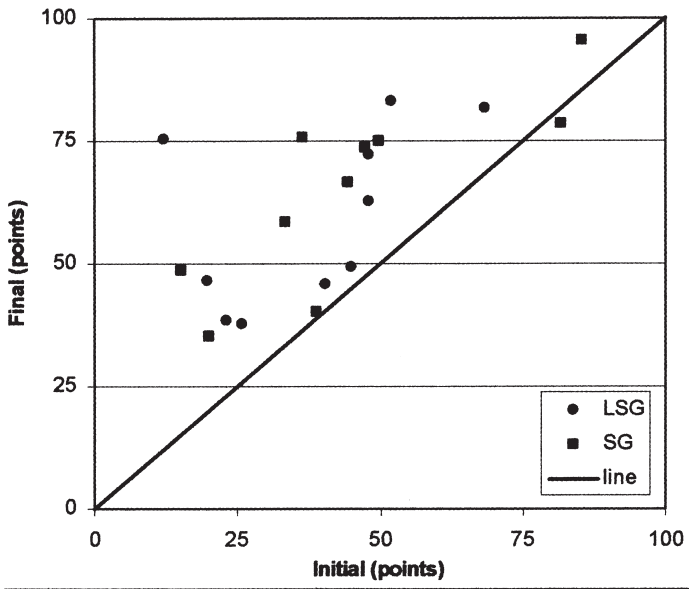

Fig. 4. Dispersion of initial and final mean scores at the SF-36 questionnaire for subjects from both groups (n = 20) (the higher the score, the better the reported quality of life). Points along the straight line indicate same scores before and after treatment.

tion subjacent to any specific therapeutic effect. For analgesia, most used laser wave-lengths are 670nm, 830nm, and 904nm; since the early 1990s there has been a prevalence of 830nm and 904nm. Simunovic (27) has shown 830nm laser to be effective at myofascial syndrome trigger points. However, the 830nm wave length used in the present study appears not to have been equally efficient in reducing FM patients pain.

Results of this study show that muscle stretching exercises have been the main responsible for reducing pain and sensitivity at tender points, thus improving quality of life of chronic patients. According to Wolfe *et al.* (32), therapeutic intervention must be directed to performing daily life activities with a minimum of discomfort. The practice of stretching exercises is one of the best ways to optimise bodily mechanics, allowing for painless movements and for body movement awareness, which are suitable to patients with FM.

As noticed above, all patients had an individual educational session with information on the syndrome, on factors that might affect pain modulation, and on possibilities of treatment. Educational programs have been used for treating other chronic conditions such as rheumatoid arthritis, as a complement to conventional treatments (33, 34). This approach also reinforces the importance of the relationship between therapist and patient. Mostly, such relationship may have certainly contributed to the improvement in patients' health condition, since the physical therapist would not merely encourage good performance of the exercises, but establish a partnership with the patient, making her an active agent of the treatment. This may have led patients to assume higher control on their condition, hence more autonomy and a better quality of life. According to Holman *et al.* (35), "...in health care the product is clearly health and the patient one of the producers, not just a customer".

In sum, this study findings point to the effectiveness of a program of stretching exercises for fibromyalgia patients, in that it allowed for reducing pain and lessening sensitivity at tender points,

with neat reflects on patients' health-related quality of life. Laser therapy as a complementary resource has not shown advantages when added to the stretching exercises. Some of the parameters of laser therapy for FM subjects must be revised, such as the interval between sessions and the laser wave length. Further studies with larger samples would be desirable. The educational approach seems to have played a positive role in improving patients' quality of life; it is thus advisable to include it as part of the treatment of FM subjects. Furthermore, the relationship between physical therapist and patient must be valued as it may lead to the latter's further autonomy, contributing to the improvement in quality of life.

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