

# Fibromyalgia Treatment: A New and Efficient Proposal of Technology and Methodological – A Case Report

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## Abstract

Fibromyalgia is a chronic disease with a higher prevalence in women, associated with functional disability and chronic pain. The most common treatments include medicines, physical exercise, nutritional reeducation, and psychological help. Physiotherapy commonly uses resources like therapeutic ultrasound and laser therapy. These therapies demonstrate great potential to decrease pain and the functional capacity of fibromyalgia patients. Fibromyalgia brings to the patient a characteristic of the excessive existence of sensory innervations in the palms of the hands. The objective of this study was to evaluate the effect of a conjugated therapy between ultrasound and laser therapy, in a symptomatic patient of fibromyalgia, considering as region of application of therapy the palms of the hands. The present study used a prototype of equipment developed to perform the combined application of ultrasound and laser therapy. A caucasian woman, 61 years old, with diagnosis of fibromyalgia, with pain complaints and decrease of functional capacity was submitted to 10 sessions, 2 times per week, with application on palms of the hands, 3 minutes in each hand. After treatment, it was observed a reduction of 8.900% in pain (Visual Analogue Scale) and an increase of 335% (Fibromyalgia Impact Questionnaire), enabling the patient to return to daily activities. This form, a case study shows the efficacy in a new proposal of technology and methodology using equipment that enables the field overlap, as well as the application on palms of the hands, bringing to the patient, once again, the quality of life.

**Keywords:** Fibromyalgia; Laser therapy; Therapeutic ultrasound; Conjugated treatment; Field overlap

## Introduction

Fibromyalgia is a chronic disease, usually causing widespread, non-articular and high-intensity pain lasting longer than 3 months [1,2]. This chronic disease affects 3% to 10% of the adult population, with a higher prevalence in women.

The proposed treatments for fibromyalgia have different characteristics: pharmacological (anti-inflammatory and analgesic action), physical exercise (due to complaints of fatigue and muscular pain), nutritional reeducation (gluten-induced inflammation) and cognitive-behavioral (psychological) [3,4]. However, technological resources of physiotherapy are used, such as laser therapy and therapeutic ultrasound. The first, makes use of its anti-inflammatory and analgesic action, besides an entire enzymatic modulation, as well as increased production of mitochondrial ATP; the second, besides the anti-inflammatory and analgesic action, decreases the conduction velocity in the nerve fibers and has thermal action [5,6].

According to Albrecht et al. (2013) [7], the etiology of fibromyalgia presents excessive sensory nerve fibers around the blood vessels located in the palms of the hands. Through this finding, a probable cause of the chronic pain of this disease may be related to the peripheral neurovascular disorder, which promotes to the patient a reduction in pain threshold and consequently the appearance of side effects such as fatigue, sleep disturbances and hyperalgesia [7]. In addition, there is a decrease in oxygenation in muscle fibers, besides

the excessive expenditure of ATP in the performance of movements [8].

The objective of this report is to evaluate the effect of a conjugated therapy between therapeutic ultrasound and laser therapy, in a symptomatic patient of fibromyalgia, using a prototype of equipment developed to promote the combined application of ultrasound and laser, considering as region of application of therapy the palm of the hands.

## Case Report

A caucasian woman, 61 year old, was received for screening in our clinical research, with a negative diagnosis for rheumatic diseases (osteoarthritis, lupus, gout, and systemic psoriasis), complaining of constant pain in several tender points (15 points of pain) in the upper limbs, with a time greater than 1 year. She also reported functional limitations on basic home-care activities, as well as sleeping problems due to generalized pain.

Additional information on age, body mass index, general health information and medication record was collected. It was verified that the patient did not use medicines. Pain and function variables according to the Visual Analogue Scale (VAS) and the Fibromyalgia Impact Questionnaire (FIQ) were evaluated using initial and final scores. The patient signed a consent term, determined by the ethics committee, previously to the initiation of treatment. The study was approved by the hospital ethics committee. (resolution 466/2012).

## Equipment and Intervention Protocol

In this research, a prototype of equipment was developed by the Laboratory of Technological Support (LAT) of the Physics Institute of São Carlos (IFSC), University of São Paulo (USP). This prototype was constructed in such a way as to allow the emission of sound and luminous energy, in order to allow the conjugate application, giving rise to the overlap of fields (Figure 1).

Therapy, combined (therapeutic ultrasound plus laser therapy), was applied to the palms of both hands for 10 sessions, 2 times per week. During the application, the probe was kept constantly in circular movements, with an angle of 90°, to maintain the application of the laser perpendicular to the skin. To ensure better delivery of energy during procedure, the surface of the hand received gel, in addition to full contact with the hand. The parameters used during the ultrasound and laser therapy conjugate were: pulsed ultrasound of 1 MHz frequency, 100 Hz, 50% duty cycle, and spatial average temporal average of 0.5 w/cm<sup>2</sup> (SATA). The laser, wavelength of 808 nm, continuous mode, power of 100 mW and power density of 60W/cm<sup>2</sup>. Both energies were administered for 3 minutes for each hand.



**Figure 1:** Demonstration of the probe by applying the ultrasound and laser to the palm of the hand.

## Results and Discussion

Table 1 shows the outcome measures at the initial and final scores. It is possible to observe an expressive improvement in pain and functionality, according to Fibromyalgia Impact Questionnaire (FIQ) and VAS (Visual Analogue Scale) scores.

The clinical case presented shows improvement in relation to the parameters evaluated in their scores. When the Fibromyalgia Impact Questionnaire values were observed (Table 1), it was possible to verify the initial score of 87 and final score of 20, which represents a 335% increase in relation to the functionality. Also, in relation to Visual Analogue Scale scores (Table 1), it presented initial and final scores of 9 and 0.1 respectively, representing a pain score reduction of -8.900%. The improvement in the previous parameters allowed the patient to fully restore their daily activities, as well as their quality of life.

Some studies point to the improvement of the patient's profile when used in an isolated way, either the treatment of therapeutic ultrasound or laser therapy [5,6]. However, recently, our group used the same

prototype equipment in the treatment of patients with osteoarthritis, obtaining an expressive result [9]. Likewise, the values presented in this case report point to an even more significant improvement when using the new technology (US+Laser in conjugated mode) and the new methodology (application in the palms of the hands).

FIQ – Fibromyalgia Impact Questionnaire			
Outcomes	Initial	Final	Δ
	87	20	335%
VAS – Visual Analogue Scale			
Outcomes	Initial	Final	Δ
	9	0	-8.90%
Δ of FIQ = (Initial value – Final value)/Final value x 100) and Δ of VAS= (Final value – Initial value)/Final Value x 100).			

**Table 1:** Outcome measures at the initial and final scores of fibromyalgia impact questionnaire (FIQ) and VAS (Visual Analogue Scale).

The application of the palms of the hands is sustained because of the excessive sensory innervation existing in the hands of patients with fibromyalgia being the likely source of pain, deregulating blood flow and thermoregulation in tissues, contributing greatly to generalized pain and increased fatigue in periods of higher metabolic demand [7]. Considering that the systemic action of these technological resources is proven [10], it is possible that the action of the field overlap and its action together with fibromyalgia can be sustained by the following hypothesis: the action of the laser therapy, structured under the pillars of the photobiostimulation, provides a severe enzymatic modulation, formation of a greater amount of ATPs, anti-inflammatory and analgesic action, so that the action of light can bring in homeostasis or inert cells, normalizing the threshold of pain. Thus, by combining its action with the therapeutic ultrasound, besides the potentiation of the analgesic and anti-inflammatory action, the facilitated opening of channels promoted by the ultrasonic action can be fundamental factors for the normalization of the organism of patients with fibromyalgia.

Thus, this new technology and methodology used in the treatment of fibromyalgia provides significant and expressive clinical benefits, both in relation to the field overlap, observed in the combined use of Therapeutic Ultrasound and Laser therapy, as well as in the application methodology in the palms of the hands employed in this patient.

## Conclusion

The case study presented shows the efficacy of the combined treatment using therapeutic ultrasound and laser therapy in equipment that provides field overlap as well as a new methodology perspective for the treatment of fibromyalgia symptoms (palms of hands). The results presented and the patient's report allow us to build a new hope in the non-pharmacological treatment of fibromyalgia.

## Ethical Approval

The study was approved by the Hospital Ethical Committee (resolution 466/2012).

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## Conflicts of Interest

All authors confirm that there is no conflict of interest.

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