

Case Report

# Can Fibromyalgia Treatment Be Performed with Photobio-modulation? Clinical Case Report

Maria Luiza Santos Cerqueira Lima<sup>1</sup>, Magali Dall'Antonia<sup>2</sup>, Fernanda Rossi Paolillo<sup>3,4</sup>, Andrea Rico Cabral<sup>5</sup>, Vitor Hugo Panhóca<sup>2,4,5,6\*</sup>, Marcelo Saito Nogueira<sup>7</sup>

<sup>1</sup>Neurology, Psychiatry and Medical Psychology, Faculty of Ribeirão Preto Medical School, University of São Paulo, Ribeirão Preto, SP, Brazil.

<sup>2</sup>Temporomandibular Dysfunction and Orofacial Pain by the Paulista School of Medicine of the Federal University of São Paulo (EPM-UNIFESP). São Paulo, SP, Brazil.

<sup>3</sup>Group of Technology Applied to Health and Motricity Sciences, State University of Minas Gerais (UEMG), Passos, MG, Brazil.

<sup>4</sup>Program in Biotechnology of the Federal University of São Carlos, São Carlos, SP, Brazil.

<sup>5</sup>Department of Orofacial Pain, Faculty Sao Leopoldo Mandic, São Paulo, SP, Brazil.

<sup>6</sup>Biophotonics Laboratory, São Carlos Institute of Physics, University of São Paulo, São Carlos, SP, Brazil.

<sup>7</sup>Tyndall National Institute, University College Cork (UCC), Cork, Irlanda.

**\*Corresponding Author:**

Vitor Hugo Panhóca, Temporomandibular Dysfunction and Orofacial Pain by the Paulista School of Medicine of the Federal University of São Paulo (EPM-UNIFESP). São Paulo, SP, Brazil.

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## Abstract

Fibromyalgia is a chronic pain syndrome characterized by the presence of chronic and diffuse pain in muscles, tendons and bones, with no evidence of an inflammatory component, in addition to having an unknown etiology and pathophysiology. The most characteristic finding is the presence of tender points that are extremely painful to palpation of muscle areas. Information about effective treatments to control pain and fibromyalgia symptoms. The objective of this study is to evaluate the allopathic treatments and effects of laser therapy and coupled therapies in the treatment of a patient with fibromyalgia. The volunteer was randomly selected and submitted to a physical therapy evaluation carried out at the Biophotonics Laboratory of the Institute of Physics of USP (São Carlos-SP), where data on the previous history of the current disease presented were made by clinical anamnesis. The patient underwent tests and evaluations: (1) Tender point positivity; (2) Painful sensation and sleep quality, through the application of Visual Analogue Scales (VAS). The treatment consisted of 2 weekly sessions, totaling 10 treatment sessions applying vacuum therapy (150 to -200 mmHg) and laser therapy (6 lasers, 660 nm and 808 nm, 100 mV). In the present study, it was found that the proposed treatment brought benefits to the patient, showing as a result the reduction of pain with a decrease in the positivity of Tender Points, in addition to improving the quality of sleep, favoring the general well-being of the patient.

## Introduction

Fibromyalgia (FM) is a common clinical syndrome characterized by diffuse pain and tender points throughout the body, head, and neck. Diagnostic examinations and tests and no radiographic or pathological findings allow the detection of this pathology with accuracy [7]. FM is considered a central nociception modulation syndrome, also known as central pain sensitization, related strictly to chronic pain [1,2,9]. FM is a rheumatological disease with a prevalence of 2.5% of the general Brazilian population (15% in medical practice), characterized by generalized muscle pain in addition to generating fatigue, changes in sleep, memory and mood [3,1,2, 10]. Symptoms may arise after a traumatic event such as surgical procedure, physical trauma, infection, or even some significant psychological tension. Prevalence increases with age, being more common in women over 50 years of age. Therefore, it is six times more common in women between the ages of 20 and 65 [9]. Statistics show that FM is the most common cause of widespread musculoskeletal pain in women aged 20 to 55 years. It affects more than 40% of patients referred to a tertiary pain clinic who meet the diagnostic criteria for FM. An appropriate diagnosis of fibromyalgia can take up to 2 years to be assertive. It is a pathology that affects 8 to 10 times more women than men, and in patients with some type of rheumatic disease, FM becomes more prone. It is not yet possible to determine the causes of the disease, but it is believed that there are a variety of factors working together and that there are supposedly genetic mutations that make the carrier more susceptible to developing the pathology [7], leading to several cases in the family [9, 5]. We emphasize the main characteristics of this pathology and therefore we believe multidisciplinary knowledge is necessary for its diagnosis and treatment [5]. The following are the main characteristics of FM: fatigue, sleep disturbances [10], rigidity [9], paresthesia, headache, weakness, symptoms similar to those of Raynaud's syndrome, depression, anxiety, mood disturbance, cognitive difficulties [10], brain fog, subjective joint swelling (without true synovitis), abdominal pain, chest wall pain, irritable bowel syndrome, Temporomandibular Disorder (TMD), pelvic pain, interstitial cystitis/painful bladder syndrome, multiple chemical sensitivities, palpitations, vulvodynia, dysmenorrhea, sexual dysfunction, weight fluctuations, night sweats, orthostatic intolerance, and chronic fatigue syndrome. LASER is the abbreviation for Light Amplification by Stimulated Emission of Radiation. The wavelengths used in rehabilitation are red (660 nm) and infrared (808 nm), considering that the absorption depends on the wavelength of the incident light, that is, red light is applied to lower depths of penetration and infrared to reach greater depths [4]. Vacuum therapy is a non-invasive therapeutic method with effects that go beyond manual therapy, as it is faster and more standardized, in addition to generating deep

mobilization of the skin and adjacent tissues, including adipose tissue and vascular and lymphatic structures, [14] promoting flattening of the epidermis and skin remodeling. This technique is characterized by the combination of positive blood pressure with negative vacuum pressure, promoting detoxification and improved blood and lymphatic circulation, in addition to promoting muscle relaxation and greater range of motion [6]. Other important therapeutic effects are the reduction of the inflammatory process and pain [6]. Therefore, the synergistic use of these therapies and technologies can generate relevant therapeutic effects in the treatment of FM and sleep improvement. Vacuum therapy is an approach resource very used in physical rehabilitation in these patients in a synergistic way with laser and allopathic medicines. Although it is difficult to prove its existence by exams, one of the most performed techniques in physical therapy practice, in addition to anamnesis, are physical exams where the main characteristic is hypersensitivity in the tender points, presenting pain in at least 11 of the 18 points [1], there is also no cure, only medications for palliative care linked to the symptoms. In this context, physical drug and non-pharmacological resources are important for the treatment of fibromyalgia [11,15]. The purpose of this study is to evaluate the synergistic effect of laser therapy synergistically with vacuum therapy in fibromyalgia.

## Drug Therapy

The FDA has approved specific drugs for the management of FM, focusing on alleviating symptoms such as widespread pain, fatigue, and sleep disturbances. Below is a list of the key FDA-approved medications for fibromyalgia therapy:

### Fda-Approved Drugs for Fm.

Serotonin and norepinephrine reuptake inhibitors are generally the medication of choice [11]. They are Duloxetine (Cymbalta) 30mg/day, which can be used up to 60mg; Milnacipran (Savella) 12.5mg/day, can be used up to 50mg/day. The combination with other medication can bring better effects such as: tricyclic antidepressants, calcium channel binder alpha2delta and Pregabalin (Lyrica) 75mg per day and can be used up to 150-225mg per day.

### Dual Multiple Receptor Inhibitors

Studies have shown symptom improvement because it has a chemically novel effect unrelated to other antidepressant groups, strongly inhibits neuronal serotonin and norepinephrine reuptake, and may weakly inhibit dopamine reuptake. In addition, it has no affinity for muscarinic, H1-histaminergic, or alpha1-adrenergic

cholinergic receptors and duloxetine, milnacipran, venlafaxine (Effexor).

## Allopathic Drug Treatments

Allopathic drug treatments are considered the gold standard in the treatment of FM within the medical literature suggested in several publications in international literature. The patient should avoid stimulants such as caffeine and nicotine. Tricyclic antidepressant drugs should be limited in their use due to the lack of uniform efficacy and relatively high incidence of side effects [16]. Despite clinically important improvement shown in 25-45% of FM patients. The most used antidepressants for the treatment of this pathology are Amitriptyline, Imipramine, Doxepin and Desipramine. Muscle relaxants have minimal efficacy data, such as: Cyclobenzaprine (Flexeril), Methocarbamol (Robaxin), Orphenadrine (Norflex) and Metaxalone (Skelaxin). In the treatment of sleep disorders in patients with FM, the use of Clonazepam (Klonopin): 0.5mg-1mg at bedtime, Alprazolam (Xanax): 0.5 – 1mg at bedtime or Zolpidem (Ambien): 5- 10mg at bedtime. Tramadol HCL (Ultram) is FDA-approved for chronic use in moderate to severe pain. Tramadol decreases pain because it binds to the opioid receptor one, inhibiting the reuptake of serotonin and norepinephrine. Both mechanisms contribute to antinociception, the disadvantages of tramadol are its variable efficacy, sedation, nausea, potential for abuse

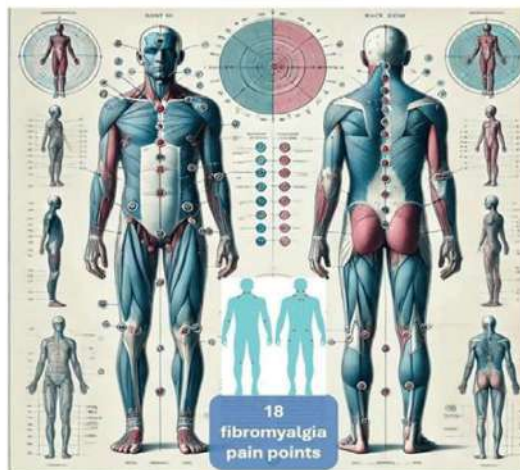


Figure 1: Each pair has one point on each side of the body, for a total of 18 points.



Figure 2: Application points clavicular and lateral epicondyles.



Figure 3: Lateral patellar application points (maybe medial).

becoming an addiction, and drug interactions e.g. SSRIs, St. John's wort, with the risk of precipitating seizures. The most recent effectiveness for chronic pain and FM is GABAPENTIN AND PREGABALIN [16]. These drugs have a published beneficial effect for patients with manifestations such as Idiopathic Restless Legs Syndrome, Postherpetic Neuralgia and Diabetic Neuropathy. They are generally well tolerated; data show significant improvement in pain and have an excellent safety profile [14].

## Off-Label Medications Used for Fibromyalgia

While not FDA-approved for fibromyalgia specifically, other drugs are often used off-label to manage symptoms: Gabapentin (Neurontin): like pregabalin, used for pain relief. Tricyclic Antidepressants (e.g., Amitriptyline): help with pain and sleep. Muscle Relaxants (e.g., Cyclobenzaprine): dresses muscle stiffness and improves sleep. Low-Dose Naltrexone (LDN): Modulates the immune system and may reduce FM symptoms (under investigation) [16].

## Non-Pharmacological Therapies

FDA-approved drug therapies are often combined with non-drug approaches such as: Exercise programs, Cognitive Behavioral Therapy (CBT) and dietary modifications.

## Methodology

This is a case study of a 28-year-old female patient, selected because she has FM, with a medical diagnosis of 3 years, but with pain resulting from the disease since she was 15, has a positive family history of fibromyalgia, in this case her mother, who was diagnosed with the syndrome at the age of 46. At the beginning of the treatment, the patient had 16 active trigger points out of 18. The main complaint presented by the volunteer was diffuse body pain, with emphasis on the lumbar region, causing several crises in which she was often unable to move, due to the reduction in range of motion caused by pain. To obtain a comparison of pain, the 18 FM trigger points were palpated in each session before and after the application.

## Application Protocol

A combined therapy equipment was used, consisting of 6 lasers, 03 diodes of 660 nm and 03 diodes of 808 nm of 100



**Figure 4:** cervical application points and scapular edge.



**Figure 5:** lumbar application points and near the semitendinosus and biceps femoris.

mV, arranged around the orifice of the insertion site of the vacuum cup, where the generation of negative pressure occurs. In the device you can select the type of laser you want to use, being only one or both at the same time (660nm-808nm), the type of suction can be in continuous mode or in pulsed mode where we have 9 different modes that change according to the duration of the pulsation. The application was performed twice a week for 5 weeks, totaling 10 sessions. Applications lasted one minute per point, excluding points near the thyroid due to possible imbalances for hypo- or hyperthyroidism. The application sites were all the points in Figure 1.

The suction cup was positioned at the points described in Figures 2 to 5, with pressure ranging from -150 to -200 mmHg. To facilitate the treatment and avoid any type of abrasion in the dermis, vegetable oil was used. Female patient, 28 years old, diagnosed with FM three years ago, but has felt the pain resulting from the disease since she was 15, her mother is also a carrier and was diagnosed at the age of 46 and because of this the patient decided to consult a rheumatologist who diagnosed her and prescribed medications that the patient took for a short period. She practices swimming twice a week which helps with her pain. She reported an initial VAS: score 8 and having 10 pain crises daily.

To have a comparison of pain in the entire session, the 18 FM pain points were palpated before and after the application.

## Results

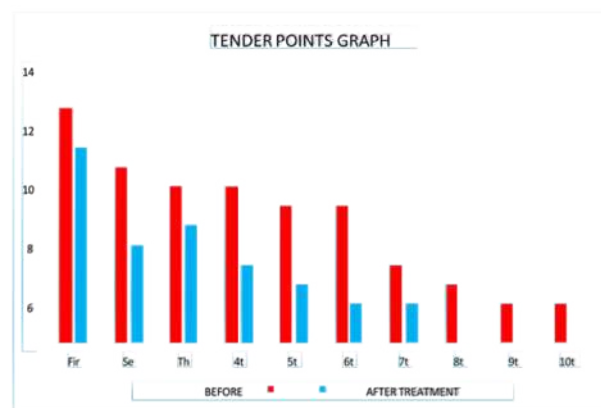
After each application, the patient showed significant improvement from the beginning of the session after the application and evolved with each session, which can be seen Initial VAS: 8 daily 10 in crises. Final VAS: 0 daily and 3 in crises.

## Discussion

FM is considered a central nociception modulation syndrome, also known as central pain sensitization, related strictly to chronic pain [1, 2]. FM is a rheumatological disease with a prevalence of 2.5% of the general Brazilian population (15% in medical practice characterized by generalized muscle pain in addition to generating fatigue, changes in sleep, memory and mood [3,1, 2].

**Table 1** – Showing evaluation by EAV of Tender Points before and after each session.

TRIGGER POINTS		
SESSIONS	BEFORE	AFTER
1st	12	10
2nd	9	5
3rd	8	6
4th	8	4
5th	7	3
6th	7	2
7th	4	2
8th	3	0
9th	2	0
10th	2	0



**Graph 1** – Showing evaluation of Tender Points before and after each session.

Symptoms may arise after a traumatic event such as surgical procedure, physical trauma, infection, or even some significant psychological tension. Many patients with FM have overlapping pathological disorders, that is, comorbidities such as: depression is present in 25-60% of patients; anxiety disorders also very common, sleep apnea can be found in up to 40% of men with fibromyalgia and repetitive leg movements or nocturnal myoclonus can contribute to fibromyalgia. According to the Brazilian Consensus of Rheumatology [1], the tricyclic compounds amitriptyline and the muscle relaxants cyclobenzaprine reduce pain and often improve functional capacity and are therefore recommended for the treatment of FM (degree of recommendation at the level of evidence. Nortriptyline was recommended for the fibromyalgia group refractory to imipramine, clomipramine which were not effective among serotonin reuptake inhibitors. There is a consensus with the use of fluoxetine in high doses (above 40mg) also in improving pain and functional capacity, with the recommendation of the use of serotonin reuptake inhibitors such as fluoxetine in combination with tricyclics is recommended in the treatment of FM. The use of sertraline, paroxetine, citalopram, and escitalopram were not recommended at certain levels among antidepressants that block serotonin and norepinephrine reuptake, such as duloxetine, milnacipran.

There is consensus on the use of moclobemide FM, an antidepressant MAO inhibitor has been recommended to reduce pain level evidence. The antiparkinsonian drug pramipexole was recommended and is especially indicated in the presence of a sleep disorder such as restless legs syndrome. Tramadol has been recommended for the treatment of fibromyalgia and it's associated with paracetamol and is considered effective for the treatment of fibromyalgia. Tropicsterone was also effective with level high of recommendation, low level of evidence. Among the neuromodulators, gabapentin and pregabalin have a grade of recommendation A. Topiramate was not recommended for FM. Corticosteroids should not be used. Nonsteroidal anti-inflammatory drugs should not be used as first-line medications. Zopiclone and zolpidem have a recommendation, Clonazepam, thinazidine and alprazolam were not indicated [1]. It is a pathology that affects 8 to 10 times more women than men, and in patients with some type of rheumatic disease, FM becomes more prone. It is not yet possible to determine the causes of the disease, but it is believed that there are a variety of factors working together and that there are supposedly genetic mutations that make the carrier more susceptible to developing the pathology, Costa et al 2020 leading to several cases in the family. Although it is difficult to prove its existence by exams, one of the most performed techniques in physical therapy

practice, in addition to anamnesis, are physical exams where the main characteristic is hypersensitivity in the tender points, presenting pain in at least 11 of the 18 points [1], there is also no cure, only medications for palliative care linked to the symptoms. Non-pharmacological treatment of FM patients should be instructed to perform musculoskeletal exercises at least 2 times a week. Programs should be individualized from moderately intense aerobic exercise at 60 to 75% of maximum heart rate and adjusted for patients' age. Other therapies such as rehabilitation and physical therapy or relaxation can be used in the treatment of FM depending on each patient. Cognitive behavioral therapy is beneficial depending on the needs of each patient. There was no consensus on the indication with clinical follow-up such as balloon therapy or acupuncture. There was consensus not to recommend bio-feedback hypnotherapy, chiropractic manipulation, and massage therapy. LASER is used in rehabilitation red (660 nm) and infrared (808 nm), considering that the absorption depends on the wavelength of the incident light, that is, red light is applied to lower depths of penetration and infrared to reach greater depths [4]. Vacuum therapy is a physical resource used in physical rehabilitation in these patients in a synergistic way with laser and allopathic medicines. This is the first clinical case that evaluated the therapeutic effects of the synergistic application of laser therapy with vacuum therapy. Pain reduction was observed with immediate effect (single session) as well as long-term (10 sessions). The treatment of pain through laser therapy occurs by the release of substances such as histamine, serotonin, bradykinin and prostaglandins, which can be inhibited or stimulated, in addition to bioelectrical and biomodulators effects such as the stimulation of ATP production inside cells. Locally, there is a decrease in inflammation due to the elimination of painful substances and reabsorption of exudates. In addition to the proliferation of fibroblasts with a significant increase in the production of pro collagen, collagen, elastin, leading to an increase in blood circulation and oxygen supply leading to an acceleration of cellular metabolism and anti-inflammatory action. Vacuum therapy consists of a clinical procedure in which negative pressure is alternated through suction cups by aspiration [14] activated by a small compressor and positive pressure that occurs by pausing aspiration, allowing the natural circulation of blood through the circulatory tracts of the skin and muscles [6].

Vacuum therapy is a non-invasive therapeutic method with effects that go beyond manual therapies, as it is faster and more standardized, in addition to generating deep mobilization of the skin and adjacent tissues, including adipose tissue and vascular and lymphatic structures, promoting flattening of the epidermis and skin remodeling. This technique is characterized by the combination of

positive blood pressure with negative vacuum pressure, promoting detoxification and improved blood and lymphatic circulation, in addition to promoting muscle relaxation and greater range of motion. Other important therapeutic effects are the reduction of the inflammatory process and pain [6]. Therefore, the synergistic use of these therapies and technologies can generate relevant therapeutic effects in the treatment of FM and can sleep improvement. The use of therapeutic laser in the treatment of FM shows promising results, especially in the modulation of neuromuscular mechanisms involved in chronic pain [4]. When laser light interacts with biological tissues, it stimulates the production of ATP in mitochondria, promoting greater availability of cellular energy. This process contributes to the reduction of inflammation, regulation of chemical pain mediators, such as serotonin and prostaglandins, in addition to enhancing tissue regeneration [8]. Recent studies highlight that laser therapy also improves musculoskeletal function through anti-inflammatory and analgesic mechanisms, being widely used in chronic musculoskeletal conditions [9]. In the musculoskeletal context, the application of laser at specific wavelengths, such as 660 nm and 808 nm, promotes muscle relaxation, reduction of tension in trigger points and improvement in range of motion, essential factors to minimize the crises of pain and muscle stiffness characteristic of FM [4]. In addition, the laser has direct action on the neuromuscular components, reducing the central and peripheral hypersensitivity associated with the syndrome. The interaction with sensory nerve fibers contributes to the inhibition of the conduction of painful stimuli, reducing sensitization in tender points. Studies suggest that the increase in local blood circulation, associated with the stimulation of lymphokines, favors the removal of pro-inflammatory metabolites and accelerates muscle recovery [11,12]. These effects, combined with the simultaneous application of techniques such as vacuum therapy, demonstrate a synergistic potential for the management of chronic musculoskeletal conditions, such as FM, and for improving patients' quality of life [10, 16]. Given the above, we can see that several clinical experiments [10,14,16] that follow the same line of research in the application of photobiomodulation for the treatment of pain and FM corroborate and suggest the robust possibility of lower power laser therapy combined with exercises or vacuum therapy as a future effective therapeutic approach in the treatment of FM, with a view to improving the quality of life and sleep of patients affected by this pathology. In this context, allopathic medicines and non-pharmacological resources are important for the treatment of FM and control of chronic pain, as suggested by this clinical case report. However, a clinical experiment with a larger number of volunteers is necessary to prove this hypothesis.

### Future Studies Highlighted for Significant Discoveries in Fm Control

The understanding of the relationship between FM and insomnia is very close and therefore, for a correct treatment approach, we must advance our understanding of this with in-depth primary studies that broadly address the various areas of health, and the current methodological deficiencies studied to maximize the relevance of clinical therapy resulting in improved quality of life. Longitudinal and interventional experimental studies must be carried out including many volunteers evaluated to establish results with excellence and impact on health therapies. Chronic diseases such as FM require a very accurate initial clinical evaluation, considering, as described above, that it can take months to make a correct diagnosis. This makes it necessary to calibrate the evaluation and therapies performed with long follow-up periods, which is essential to understand the volunteer's general clinical picture and present comorbidities. Calibration of the diagnostic criteria for FM is an essential step to avoid creating bias in current research, avoiding experimental results that can be presented in a limited manner, preventing reasonable statistical evaluation, comparability and reproducibility of the experiment. A recent study shows the effect of photo biomodulation correlating laser application to the pineal gland intraorally and producing improved sleep-in volunteers treated for Parkinson's disease [17]. Genetic polymorphism and variability in drug metabolism by volunteer are equally important. Demographic factors, racial miscegenation, age, adherence to treatments, eating-related behaviors, addictions, smoking, infections, and previous diseases increase the difficulty and accuracy of experimental studies in FM. New experiments and treatments for FM should be approached collaboratively by specialists in medicine, dentistry, psychology, and other health specialties to guide investigations, promoting a multidisciplinary or transdisciplinary care and diagnosis model for the general treatment of the individual with excellence.

### Conclusion

This clinical case analysis together with our observation and publications of the physiological effects caused in the tissues treated with laser therapy and vacuum therapy indicates that vasodilation, improved oxygenation and nutrition of these tissues, activation of the vessels of the lymphatic system thus helping in the elimination of cellular toxins. Therefore, this suggestion of synergistic or alternative treatment for FM, sometimes accompanied by edema, compacted fibrous tissues, and loss of tone of the treated tissues accompanied by pain.

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## Conflicts of Interest

The authors declare no conflicts of interest.

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