

Low level laser therapy and myofascial pain

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Abstract

An effective treatment modality leading to freedom from pain for whiplash syndrome, tension headache and post-concussion syndrome is presented. The background and theoretical basis of low level laser therapy is presented. Five cases representing patients treated with low level laser therapy are reported. The need for financing is discussed.

Keywords: Inflammation, myofascial pain, whiplash syndrome, tension headache, post-concussion syndrome

Introduction

There are at least 300,000 and possibly 500,000 to 600,000 Danes suffering from more or less chronic myofascial (myos is Greek for muscle and fascie is Latin for ligament) pain. This figure is gleaned from my experience as a municipal medical consultant with approximately 10,000 cases over my table, where about half of these had myofascial pain syndromes as their presenting issue – whiplash syndrome, tension headache, post-concussion syndrome, lower back pain and many others. The number is derived by taking the percentage of the population locally and multiplying this by the total population.

The most common and well-known examples of myofascial pain are whiplash syndrome, post-concussion syndrome, and tension headache. This is a very poorly researched area, and my observations are based on my own experience. Other less common myofascial pains include frozen shoulder, mouse arm, tennis and golf elbow, lower back pain, facet joint syndrome, groin pain, bursitis coxae, unspecific joint pain in general and unspecific muscle pain. I have been unable to find literature to document this. This also is based upon my own experience.

All of these syndromes are characterized by a lack of specific treatments and so far, no generally applicable, effective solution has been described.

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Again here, there is no literature documenting this, but the issues are plain for anyone dealing with these patients. This article has three purposes. The first is to describe the importance of examining the condition of the muscles when facing patients with myofascial pain. The second is to describe low-level laser therapy (LLLT) as an effective therapeutic form for myofascial pain, and the third is to illustrate the effect of this treatment with some examples.

No one knows how many patients with tension headache have been diagnosed with migraine, but there is no doubt that this misdiagnosis exists. This is again one of those truths that everyone knows, but that no one has been able to document. This is one of the common elements of our methodology, that we are perfectly capable of documenting what we do right, but horribly incapable of documenting what we do wrong. It is wasteful and/or deleterious for our patients. The main reason for this misdiagnosis is the lack of examination of the condition of the neck muscles, which is the cause of tension headaches. In my experience, none of the patients I have examined have ever had their neck muscles examined by any of up to 35 different doctors and other therapists. Examining the muscles of the neck, one can determine whether or not platysma, the scalenes and trapezius muscles have normal consistency or, as is the case with patients with tension headaches, have increased tension and often with myoses. It takes a little training to complete a sufficient examination, but everyone with reasonable fingertip sensibility, knowledge of anatomy and pathophysiology can easily learn to do a qualified exam of the tension status of the neck. Specifically, myoses on the medial scalene can cause visual disturbances that contribute to the misdiagnoses (1).

The examination technique requires palpation of the named muscles with a light hand, so that the muscle structure can be felt through the skin. It is decisive to examine the entire muscle. There is often a significant difference from side to side, which makes the discovery easier, as the difference is clearly felt. I find it most expeditious to do the exam on a gurney with a head holder so that the patient relaxes as much as possible during the exam.

Once such tensions have been established, there is a basis for referring to a clinic with experience in resolving the tensions. When the tension is resolved,

the symptoms disappear. This is evidenced by my experience.

The past efforts have not been satisfactory. Although also not based in the literature, no treatment modality to date has been successful. The same applies to tension states that cause pain in other body parts than in the neck and in the head. It is clearly more difficult to detect tension in the deeper muscles, but a thorough history and prior examination with blood samples (exclusion of cancer, rheumatoid arthritis and vitamin D deficiency), ultrasound, X-ray, CT and/or MRI scan, which exclude more serious causes of pain, are usually negative in myofascial pain patients. When all studies show normal results, one can conclude that muscle tension and/or inflamed tendons and/or joints are the cause of the pain.

LLLT made its debut in Hungary in the early 1960s. A Hungarian surgeon Edre Mester (EM) has been credited with using it for the first time (2). It was shortly after the ruby laser was put into use. During experiments with mice where he wanted to demonstrate the effect on induced skin tumors which he could not detect, however, he noted difference in the hair growth rate in the treated group compared with the untreated group (3). Since then, attempts have been made to use LLLT over a number of conditions, of which myofascial pain is the area where the greatest effect is achieved (4). There are numerous laser devices on the market, but the device that is best documented and with EU approval is LX2 from Thor Laser in the UK. LLLT has been the subject of study at the Harvard University School of Medicine, which has published an account of the mechanism of action (5). It is a biphasic light source with a visible element of 720 nm and an invisible laser light of 613 nm. The visible light does not penetrate the skin, but the laser beam reaches 5-6 cm. under the skin, depending on the tissue type. There is no complete clarity on how it works, but there is no doubt that it acts as a powerful antioxidant locally. The role of antioxidants in reducing inflammation is well described (6). It is less clear that myofascial pain is dependent on inflammatory processes, but what else should it be? It is further well-described that LLLT acts anti-inflammatory (7).

The muscles reveal varying degrees of affection by stress. It can be purely mental stress that affects the muscles and various physical stresses that become chronic pain syndromes. Head trauma, including

concussion and whiplash, affects the neck muscles in varying degrees of severity as tension and/or myoses in the neck region. There is no obvious logical explanation for why post-concussion patients have the same tensions in the neck as whiplash patients, but that this is the case is clear to anyone working with both groups (8, 9).

A patient who could probably have been cured, but who could not afford the treatment, and where the municipality would not provide subsidies, is explained below. Most of us have met such patients, and the attitude is generally that one must learn to live with it.

A middle-aged man was hit some years ago by a car that did not yield as it should, while the man was riding on a scooter. The collision was so forceful that the patient was thrown over the car and landed first on his head, then on his left shoulder. The helmet he was wearing shattered. He was whisked to the emergency room, which did not reveal any broken bones or evidence of internal injuries, and he was sent home. In the weeks following the accident, the symptom complex that the patient was afflicted by developed. The symptoms are severe, constant back pain, left shoulder and upper arm pain, and fingers that sleep more or less constantly, which is most pronounced on the left side. In addition, he suffers from dizziness almost constantly, which is worst when he is tired, and frequent headaches. He needs rest often, but cannot find peace. He sleeps badly at night due to pain and tension, and must often rest during the day for that reason. From the objective examination: The body from the diaphragm and below is unaffected. The left arm can be moved slightly backwards, but not to the opposite hip. It cannot be pressed over the horizontal passively (due to pain) or actively. Good strength over the elbow, wrist and fingers. Right arm is normal. All the muscles in the neck are very sore, and with pronounced myoses in the platysma, scalenes and trapezius, which are hard as wood on the left side and quite firm on the right side. Down the back, all muscles are very tense and hard from the top down to the sacroiliac joint, no soreness below this level.

This was a pronounced muscle-related problem with severe myoses, which had been attempted treated with physiotherapy and painkillers without effect. The condition is treatable with LLLT and massage. At

least 30 treatment sessions would have been necessary, presumably taking 45 minutes per session although more treatments cannot be ruled out, depending on the result. The end-result would probably have been full recovery and return to workability, but at least a significant improvement would be achieved, and most likely a freedom from medication. The patient wanted to give the treatment a try, but since there was no financing available, the case did not continue.

Methods

Treatment with LLLT is delivered via a probe which is placed on the skin over the target muscle. It is not important that the skin is bare, but it does help to identify the underlying structures. The apparatus has two settings that are adjustable, that is the frequency of the flashes of the given light and the duration of the treatment. The frequency can be set from 2.5 Hz up to continuous over 12 increments, and the duration can be between five seconds and five minutes, also over 12 increments. Only two of the settings were used in this study that is 2.5 Hz lasting 30 seconds, and continuous lasting two minutes. Treating a whiplash patient, which typically takes half an hour, typically includes a full treatment for all three scalene muscles, and varying portions of platysma and trapezius. These are treated with 2,5 Hz for 30 seconds per site. C3, C4, and C5 are given continuous light for 2 minutes per site. The probe heats up during use, but not to a dangerous level. It heats up to about 39°C before giving off as much heat as it creates. The tolerance of this heat varies extremely in patients. I switch between two identical probes so that one can cool off while the other is in use. A 40 mm probe delivers 5 W and penetrates 5 to 6 cm under the skin. A 65 mm probe delivers 1 W and penetrates approximately 1 cm under the skin. Experience dictates that treatment every other day is optimal. The duration of the treatment in terms of number of sessions varies extremely, from 10 to over 100 sessions until freedom from pain. Meanwhile, an average number is from 30 to 40. To date, no damage or side effects have been reported with LLLT. The only danger that has to be prevented is looking directly into the laser beam which can damage the retina.

Results

There have been 178 patients in my clinic until now, and of these 25 with whiplash syndrome, 19 with post-concussion syndrome and 23 with tension headache. All of these patients have become pain-free, none of them have relapsed. The rest of the patient population is a mix of various diagnoses, all of which have myofascial origins. There have been a number of scar tissue patients, and patients with eczema which have all improved significantly. None of the patients have continued with the same medicine that they took when they came to the clinic after ended treatment. This attests to the power of the treatment. Some patients have presented with pain syndromes that do not make any sense in a traditional medical model, but LLLT helped them nonetheless.

The following five examples will illustrate the effect of treatment with LLLT. These have been chosen to represent their case type. Any of the N=178 could have been chosen. The point is to illustrate the power of the treatment.

Patient 1 was a young man who had fallen off a horse 4 years earlier and had hit his head and neck and his back on the hard ground underneath. There were no immediate signs of major damage and no visible wounds. In the weeks following the fall, the boy developed a severe, constant headache, which was the subject of numerous studies. Among other things, a syringomyeli was detected at the L1 level, low pressure in the spinal canal and a moderate Scheuermann. None of these conditions could be linked to the headache. Various neurosurgical departments, pediatric wards and other specialists had found and accepted indication for treatment with Tradolan, Ibuprofen and Paracetamol as well as Omeprazole to protect against the side effects of the Ibuprofen. There was no focus on the neck muscles. On one out of approximately 100 pages of documentation in the case, there was one sentence describing the tense neck muscles by a physiotherapist. This passage did not have any consequence that one could glean from the documentation. When I met the patient, he had a very knotty neck, where especially the medial scalene was a chain of myososes, which was extremely sore. There were, as is usual for this type of patient, large myososes in trapezius both near the cranium and in the mid-clavicular level (MCL). After

a series of treatments with LLLT and massage and the physical training I directed for the patient, he was completely free of the medicine and had a slight headache approximately once a week that did not require medication. His neck muscles were without myososes, but still a little tense. The treatment was completed 2 years ago, and the condition has remained pain free.

Patient 2 was a middle aged man who two years before the exam in my clinic, was involved in a classic rear-end collision that hit the patient's car with such speed that neither of the cars could drive from the scene of the accident. The patient was wearing a seat belt and airbags were released. As usual for these cases, the primary examination at the hospital was without special findings. Approximately one year after the accident, the patient was awarded 8% disability and had been diagnosed with incipient dementia due to his reduced memory and concentration (common accompanying symptoms of whiplash syndrome). Again, no one in the process had examined the patient's neck muscles. When I met the patient, he had severe tension in the neck muscles and myososes in the medial and posterior scalenes as well as in the trapezius near his cranium and in the MCL. After a series of 32 treatments he had become pain free, his neck muscles relaxed, and he had regained his memory and concentration. The treatment has been completed three years ago and the condition has remained pain free.

Patient 3 was a young woman suffering from whiplash syndrome after two rear-end collisions. She had constant headaches, strained neck muscles and was depressed all the time. After a few treatments she felt much better, and her treatment could end after nine sessions. The patient had no longer any pain and a relaxed neck. She had regained her energy and was happy again (an unusually short process). The treatment has been completed three years ago and the condition has remained pain free.

Patient 4 was a middle-aged man who suffered a concussion of medium severity approximately three years previous to his appearance in the clinic. He had been examined by neurologists, neurosurgeons and his own GP and treated with various measures, including physiotherapy and strong painkillers. He suffered from severe, daily headaches, difficulty in concentration and memory and pain in the neck and

back. His physical condition made him so depressed that he had seriously considered taking his own life. After approximately 10 treatments, his medication could be reduced. The headache and neck tension gradually disappeared. Life returned little by little, and after 40 sessions he could be discharged without medication and without pain. His memory and concentration had returned and he could get back to his working life. The treatment was completed 3 years ago and the condition has remained pain free.

Patient 5 was a middle-aged woman who slipped and fell on ice in the winter and hit the back of her head. She had a very bad time during the ensuing days. It went better for a short while, but after a few weeks, headaches and neck tension started. This increased over a couple of months and remained unchanged until she presented in the clinic about half a year after the accident. She had been at a pain center where they had put her on treatment with pain medication. In my clinic she was treated with LLLT and massage. It took about seven sessions before she could feel any improvement, and after approximately 11 treatments, she could discontinue one of two painkillers. After approximately 18 treatments, she could stop using the other, and within a few weeks she was completely free from headaches. After 34 sessions, she had fully recovered and was able to go to work again. She was happy and cheerful again. The treatment is completed two years ago, and the condition has remained pain free.

All 178 patient records have the same level of documentation and follow-up. LLLT in the hands of an experienced clinician is an effective treatment for myofascial pain.

Discussion

A thorough knowledge of anatomy and pathophysiology is crucial. In practice, this means that one must be medically trained to achieve the best results. To date, there is no agreement on the effect of laser therapy in the literature, but in my experience amazing results were obtained with this technique. In my clinic, there is thus a 100% success rate with whiplash, tension headache and post-concussion syndrome (N = 178 at the time of writing). Freedom from pain is the dependent variable. In spite of the

documentation and the good experience, the treatment has not yet been taken on any payer's agenda in Denmark, so the treatment must be patient-financed, which excludes most people with chronic pain from the treatment. Most of the patients with myofascial pain have quite limited funds to pay with as they live either on sick pay, cash benefits or disability pension (evidenced by my extensive experience with these patient groups).

There are three main reasons why public clinics have not taken LLLT on the program. The first and most important is lack of knowledge of the therapy and its effect, which this article attempts to address. The second is the time spent with the individual treatment, typically half an hour, sometimes less, sometimes more. The third is the price of the equipment, which is around DKK 80,000.

LLLT is widespread in the UK, USA and Canada but not yet in the Scandinavian countries. Payment from public or insurance-based payers would allow many more to afford the treatment, thus bringing many back to productive lives that are now unable to work.

Ethical compliance

The authors have stated all possible conflicts of interest within this work. The authors have stated all sources of funding for this work. If this work involved human participants, informed consent was received from each individual. If this work involved human participants, it was conducted in accordance with the 1964 Declaration of Helsinki. If this work involved experiments with humans or animals, it was conducted in accordance with the related institutions' research ethics guidelines.

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