
Microcurrent Treatment of Myofascial Pain in the Head, Neck, and Face

Purpose: To study the effects of microcurrent treatment of resistant myofascial trigger points in the head, neck, and face. **Methodology:** A review of the rationale for effectiveness and averaged outcomes of 50 cases of resistant, chronic myofascial pain in the head, neck, and face treated with microcurrent. **Results:** Of 50 patients with resistant chronic myofascial trigger points, 49 had lasting reduction of myofascial pain following an average of 11.2 treatments. These results followed an average of 7.9 weeks after having failed with one or more traditional treatment techniques. **Conclusion:** Microcurrent treatment of resistant myofascial pain using graphite/vinyl gloves is within the chiropractic scope of practice in most states and makes effective use of chiropractic expertise in the treatment of myofascial complaints. The results are encouraging and suggest that further study is warranted. **Key words:** *electric stimulation therapy, facial pain, myofascial pain syndrome, neck pain, physical therapy*

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Algorithm appears in Appendix B

MYOFASCIAL TRIGGER points are a well-documented source of head, neck, and face pain. Travell and Simons¹ mapped the myofascial trigger points in the muscles of the skull, jaw, and cervical spine that refer pain in characteristic patterns. Myofascial pain can cause severe and even debilitating pain in the head, neck, and face and can lead to restrictions in the normal biomechanical function of the joints. Also it can cause impairment of normal neurologic function, circulation, and lymphatic flow resulting in a variety of symptoms such as lymphatic congestion, vasomotor rhinitis, sinus congestion, difficulty swallowing, ear pain, dizziness, tinnitus, dry cough, blood pressure fluctuations, paresthesias in the face, itchy ears, toothaches, eye pain, blurred or double vision, migraine or tension headaches, and restrictions in cervical motion.^{1,2} In general, the patient perceives the pain and paresthesia as emanating from the referral area and is unaware of the location of the trigger point causing the pain.¹ Figs 1 through 3 illustrate referred pain patterns.

When a muscle sustains trauma or when the body is exposed to repeated stressors, the muscle responds with spasm or, more commonly, contracture. Contracture is a chemical rather than an action-potential-mediated shortening of the muscle.¹ Hans Selye³ observed that patients respond to repeated stressors with something he called *calcyphylaxis*. He defines *calcyphylaxis* as "an induced hypersensitivity in which

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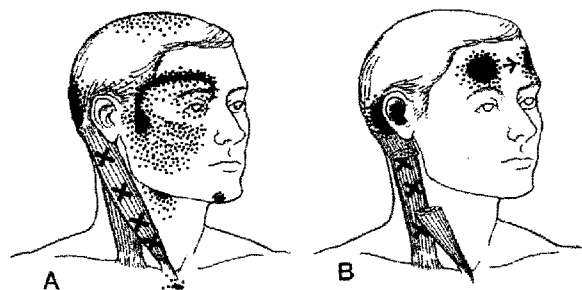


Fig 1. Referred pain patterns (black areas indicate essential zones while stippling indicates spillover areas) with location of corresponding trigger points (X) in the right sternocleidomastoid muscle. (a) Sternal (superficial) division. (b) Clavicular (deep) division. *Source:* Reprinted with permission from J. Travall and D. Simmons, *Myofascial Pain and Dysfunction*, pp. 203, 261, 322. © 1983, Williams & Wilkins.

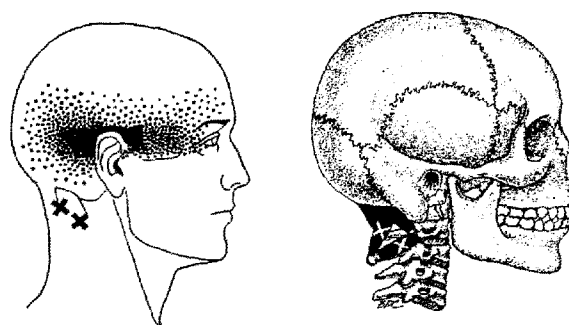


Fig 3. Referred pain pattern (black) of trigger points (X) in the right suboccipital muscles. *Source:* Reprinted with permission from J. Travall and D. Simmons, *Myofascial Pain and Dysfunction*, pp. 203, 261, 322, © 1983, Williams & Wilkins.

tissues respond to various challenging agents with a sudden calcification."^{2(p17)} The type of stressor (ie, chronic illness, severe emotional trauma, multiple or severe injuries to the tissue) does not matter. Repeated experience of a sympathetic stress response will cause predictable tissue changes.^{2,3} These tissue changes cause tightening of the myofascia and muscle contracture promoting formation of a trigger point.² Travell and Simons¹ propose a more mechanical model in which a traumatic, rapid overstretching of the muscle or crush injury can rupture the myofibrils causing leakage of calcium from the sarcomere and subsequent contracture. Whatever the proposed mechanism, mineral deposits in the myofascia set the stage for contracture and trigger point formation.

Both spasm and contracture cause a reduction in the blood supply to the area, decreasing oxygen transport and waste

removal and causing the myofascia to tighten. Dysfunction in this delicate fascial membrane, which encases each myofibril, disrupts the flow of neurotransmitters. Ground substance within the myofascia changes from a liquid to a gel to a solid, further tightening the myofascial tissue.^{1,4} The local ischemia in muscles containing myofascial trigger points decreases adenosine triphosphate (ATP) production, disrupts the sodium pump and normal membrane conductance, and increases metabolic wastes, creating a self-sustaining cycle of dysfunction that perpetuates trigger point formation.

Treatment of these trigger points is difficult due to the delicate nature of the cervical structures underlying the muscles containing them. In some muscles, such as the pterygoids and the suboccipitals, the location of the muscle makes access difficult.¹ Nevertheless, a series of coincidences resulted in a very promising new treatment for trigger points in the head, neck, and face using microcurrent applied with graphite/vinyl gloves.

TRADITIONAL MICROCURRENT THERAPY

Microcurrent therapy is used to increase the rate of healing in injured athletes, control pain, increase the rate of fracture repair, and treat myofascial pain and dysfunction.⁵⁻⁸ It provides subsensory current to the tissues in millionths of an ampere. Other widely used electrotherapies provide current in milliamps. One microamp (μA) equals 1/1,000 of a milliamp (mA).

In Cheng's study⁴ of rats, electrostimulation of the tissues with microcurrent resulted in increased ATP concentrations, protein synthesis, and membrane transport. With currents from 50 μA to 1,000 μA , the ATP levels were increased threefold to fivefold. With currents from 100 μA to 500 μA , the stimulatory effects were similar. With currents exceeding 1,000 μA , the ATP concentration leveled, and at 5,000 μA , it

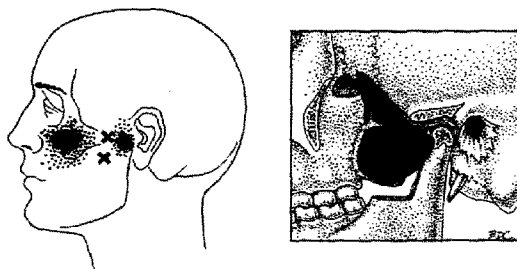


Fig 2. The referred pain pattern (black) of trigger points (X) in the left lateral pterygoid muscle. See Fig 3 for anatomical notes. *Source:* Reprinted with permission from J. Travall and D. Simmons, *Myofascial Pain and Dysfunction*, pp. 203, 261, 322, © 1983, Williams & Wilkins.

was reduced slightly as compared with the non-treated controls. Similar effects were noted in regard to protein synthesis. At about 500 μA , there is a tremendous enhancement of protein synthesis, but when the current exceeds 5,000 μA the trend reverses into suppression.⁴

Microcurrent affects the injured tissue in several ways. It increases ATP production and membrane active transport. It also allows the intracellular flow of nutrients and the extracellular flow of waste materials.⁵⁻⁸ These effects reverse ischemic changes and counteract the reduction in ATP synthesis seen in tissues with myofascial trigger points. Moreover, the work reported herein shows that specific microcurrent frequencies affect tissues in different ways.

DEVELOPING A NEW TREATMENT METHOD

A series of coincidences began in February 1996 that led to the development of this treatment method. The first event occurred when a microcurrent instrument normally used for cosmetic purposes was purchased for the author's clinic. The device came with a pair of graphic/vinyl gloves. These lightweight gloves have electric micro-jacks cemented to the dorsal surface and are designed to conduct current and provide good tactile perception. It was obvious they would be useful in applying microcurrent to muscular tissue.

A second coincidence occurred when a naturopathic intern developed an interest in the work of Albert Abrams and the other medical physicians of the early 1900s who used specific electromagnetic frequencies to achieve specific therapeutic effects. Traditional microcurrent therapies use a limited number of frequencies. The most common ones are 0.3 Hz for increasing healing; 3 Hz for stimulating acupuncture points; 30 Hz for controlling pain; and 300 Hz for reducing edema and stimulating lymphatic flow.⁵

The third coincidence occurred when two chiropractors and an orthopaedic surgeon began referring their intractable cases of myofascial pain for treatment. This large, challenging, and varied patient base, which included 350 new patients between February 1996 and June 1997, provided an excellent learning opportunity leading to refinement of treatment techniques and frequencies.

Unlike traditional trigger point therapy that requires injections or firm, and often painful, pressure,¹ application of microcurrent to the tissue causes the tissue to soften with minimal to no pressure. When the frequency is "correct," the tissue relaxes under the therapist's fingers until that frequency has finished its portion of the work. When the changes stop, further use of that frequency during that session is usually not productive; different frequencies must be used to produce results. Based on experience, the author has established a sequence of frequencies that produces fairly consistent results. Each time the correct frequency is chosen and applied

there is a feeling of the tissue going "smoosh" under the operator's fingers. The patient generally feels a sensation of warmth, softening of tissue, and pain reduction.

There are frequencies thought to be specific for conditions such as fibrosis, scar tissue, mineral deposits, allergy reaction, inflammation, viral infection, and spasm, and frequencies for specific tissues such as veins, muscles, connective tissue, arteries, and nerves.⁹ Frequencies also exist to stimulate healing and remove tenderness. The author uses about 20 combinations of frequencies on a regular basis. Some were derived by trial and error, and some were borrowed directly from electromagnetic therapies used by medical physicians in the 1920s to 1940s.⁹ The sequence of frequencies used is individualized somewhat depending on the condition of the muscles and the operator's perception. Generally the author starts with a series for "fibrosis," followed by frequencies used for "mineral deposits." Next, four frequencies for "fibrotic debris" are delivered.

It is interesting that the frequencies found to be effective were described as treating conditions such as fibrosis and calcium deposits that correlate with the proposed mechanisms of myofascial dysfunction. The author has observed, measured, and palpated the effects of the frequencies, but short of dissection or biopsy there is no way to know the specific effect(s) on tissue with any certainty.

Response is frequency specific. An inappropriate or ineffective frequency produces no change in tissue no matter how long it is applied. A correct frequency yields the characteristic softening of the tissue in seconds. This response occurs even when the operator is unaware of the frequency being used. In the current study, trials were performed with the operator blinded to the frequency, and the tissue response was consistent, independent of the operator's expectation or knowledge.

THEORETICAL MODEL TO EXPLAIN THE EFFECTS OF SPECIFIC FREQUENCIES

The author hypothesizes that specific microcurrent frequencies can cause dramatic and apparently permanent changes in myofascial tissue in several ways. First, microcurrent frequencies may interact or resonate with biochemicals based on the thermodynamic and electromagnetic conditions created by the order of the molecules and their configuration. A resonance state between a specific frequency and a molecule/configuration combination could cause a shift specific to that combination up to the limit of its ability to change within the surrounding matrix. This process would happen instantaneously.

A second mechanism involves the thermodynamics of organic tissue. Physical tissue is a collection of biochemicals, molecules arranged in a certain order, formed and folded in a specific thermodynamically stable configuration. These biochemicals are stable in an "energy well" and require an

energy "boost" to move from one energy well to another. It is possible that current applied to one stable configuration provides the energy needed to shift the tissue to another stable configuration in a different energy well. The biochemicals would be in the same order but the tissue would be folded in a different way. If this hypothesis is correct, the shift would happen instantaneously and would be permanent unless energy and/or resonance were applied to move the system back to the prior configuration.

When these hypothesized mechanisms are added to the known mechanisms of microcurrent to increase ATP production, protein synthesis, and membrane transport, it is possible to see why the clinical results are so rapid, consistent, and lasting.

DESCRIPTIVE RESULTS

The author treated 250 new patients in 1996 and examined the results in 137 cases of "simple" chronic myofascial pain in various body regions uncomplicated by disc injury, neuropathy, or severe arthritides, most due to prior trauma or chronic overuse. Symptom duration ranged from 8 months to 22 years. The majority of patients had been treated by one or more prior therapies including prescription drugs, physical therapy, surgery, chiropractic, acupuncture, trigger point therapy, and massage. Of those 137 patients, 128 completed treatment. Pain was reduced in 126 of those 128 from an average of 5–8/10 to a 0–2/10 using an anchored pain scale (verbal self-report). Two patients had pain reduced from the 5–8/10 range to 3–4/10 range. Treatment duration varied between 6 and 60 visits depending on the severity, complexity, and chronicity of the case. Patients were told to return if the pain recurred or motion became limited. To date only six patients have returned for follow-up treatments. The results seem to be long-lasting and possibly permanent. No follow-up questionnaires have been sent.

Further refinements in treatment techniques and frequencies resulted in improved patient response and reduced the number of treatments required. Data were retrieved from the charts of 100 new patients seen between January and June 1997, and the results are quite encouraging.

Fifty patients from the above described sample had head, neck, or face pain resulting from chronic myofascial complaints. There were 5 acute cervical and 21 chronic low back complaints. The remaining patients reported pain in the shoulder or another extremity or thoracic pain. Most patients were referred to the clinic by other physicians (medical, chiropractic, or naturopathic) or patients. Chronic pain was defined as pain lasting longer than 90 days following the precipitating trauma.

OUTCOMES IN HEAD, NECK, AND FACE PAIN PATIENTS

All but one of the chronic cervical patients had their pain reduced significantly and apparently permanently. The chronic cervical patients required an average of 11.2 treatments (range, 1 to 34 treatments). The average duration of treatment was 7.9 weeks (range, 1 day to 5 months). The pain was reduced from an average of 6.8 to an average of 1.5 on the pain scale. The average length of chronicity was 4.7 years (range, 1 year to 28 years). Many patients had pain chronicity of 2 to 5 years. The one patient who did not benefit significantly had her pain reduced from an 8/10 to a 5/10 during treatment but the improvement did not last. After 33 treatments over the course of 12 weeks, treatment was abandoned. Her injury, which was 5 years old, had been refractory to all other methods of treatment including injections and other mechanical methods and electrotherapies.

Range of motion (ROM) appeared to increase in all patients; however, no detailed quantification was performed. Increases in flexion/extension of 20° to 30° after the first 20-minute session appeared to be typical. Approximately 80% of this increase persisted until the return visit 4 days later. The ROM increase was sustained over time.

Prior to this study, 88% (44 out of 50) of these patients reported unsuccessful use of other therapy. Of these 44 patients, 75% (33) had failed with prior medical management, 55% (24) had failed under chiropractic care, 39% (17) had unsuccessfully used physical therapy, 11% (5) had failed with naturopathic approaches, and 7% (3) had tried acupuncture without success. Many patients had used two or more of these therapies.

INTERVENTION

Interventions included massage, specific microcurrent frequencies administered with graphite/vinyl gloves and or pads (unattended), and manipulation as needed. Treatments lasted 20 to 40 minutes and occurred no more than twice a week. Treatment frequency was reduced to once a week when the patient was pain free for two consecutive visits and to once every 2 weeks when the patient was functional between visits. Treatment was discontinued when the patient was pain free after 4 weeks without a treatment.

Microcurrent was the only electrical modality used to treat the myofascial tissue. The microcurrent instrument used was a two channel, Precision brand microcurrent

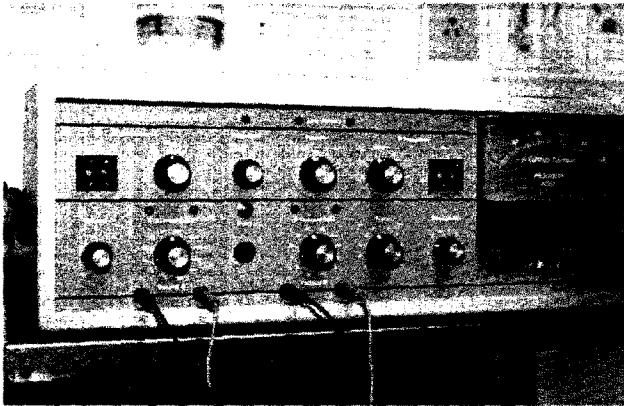


Fig 4. Any two-channel microcurrent instrument with two-digit frequency specificity and three-place capacity can be used. Precision Micro was the brand used in this setting.

with two-digit frequency specificity and three-place capacity (see Fig 4). For example, the numerals 7 and 6 can be modified with a 0.1, 1, or 10 multiplier to form the numbers 7.6, 76, or 760. The machine can be used with cotton tipped probes for stimulation of acupuncture points or with four leads that attach to either pads or gloves.

Patients were usually given home stretches and exercises within the first 2 weeks. Conditioning, which was gradual and gentle, was designed to increase muscle oxygenation and mobility before increasing strength. Supplements were used to provide the nutrients for proper muscle metabolism and to enhance liver detoxification pathway function.



Fig 5. It is possible to treat the suboccipital muscles by inserting one finger into the buccal area at the back of the mouth and placing the other at the back of the neck. The current passes through the damaged tissue and causes it to change.



Fig 6. Intra-oral technique makes it possible to treat the pterygoids and deep scalenes quickly and comfortably.

TREATMENT ADVANTAGE IN HEAD, NECK, AND FACE PAIN

The treatment technique made possible by use of the graphite/vinyl gloves is a real advantage in treating the sensitive musculature of the head, jaw, and neck. In order to be effective the current must simply pass through the dysfunctional tissue. Compression is not essential to the process. Thus it is possible, for example, to treat the suboccipital muscles by inserting one glove into the buccal area at the back of the mouth and placing the other on the suboccipital area (see Fig 5). This intra-oral technique can also be used to treat the



Fig 7. The deep scalenes and cervical paraspinal muscles can be treated by passing current through the muscle bilaterally.



Fig 8. When there is referred pain, positive polarized current is applied to the active trigger point; negative current is applied to the referral area.

pterygoid, digastric, omohyoid, scalene, cervical paraspinal, levator, and trapezius muscles (see Fig 6). The current must travel from the intra-oral glove through the muscles to the external glove wherever it is placed. Unlike injections, which can only treat small areas, this method allows treatment of entire muscles and synergist/antagonistic muscle groups at the same visit allowing a smooth return of normal biomechanical function to the painful dysfunctional region (see Fig 7). In the treatment of referred pain, positive current is applied to the trigger point while negative current is applied to the referral area (Fig 8).

SIDE EFFECTS AND CONTRAINDICATIONS

Side effects include a posttreatment detoxification reaction starting approximately 90 minutes after treatment and lasting 6 to 24 hours. Symptoms include slight to moderate nausea, flu-like aching, and sometimes a slight increase in pain. This reaction can usually be avoided by consumption of 2 quarts of water in the first 3 hours after treatment and use of a supplement that provides phase one and phase two liver detoxification pathway substrates. The reaction was less pronounced after the fifth or sixth visit.

Five patients did not tolerate microcurrent. One had had her first rib removed, a cervical fusion performed, and a spinal stimulator installed. She experienced muscle spasm when microcurrent was applied, even when the stimulator was turned off. One had confirmed Agent Orange exposure and experienced muscle spasms when microcurrent treatment was attempted. One was a three-pack-a-day smoker who did not tolerate any electrical modality. Two were patients with spinal

cord injuries who progressed from numbness to hyperesthesia after brief exposure to microcurrent. The usual cautions and contraindications for microcurrent were otherwise observed (ie, not used through the eye or a pregnant uterus or on patients with demand-type pacemakers).

STUDY LIMITATIONS

There are several caveats that must be stated when assessing these results. First, this sample was neither average nor random. The patient sample was refractory to other treatment techniques but these patients had been led to expect a positive outcome by their referring physician. Second, there was no systematic control group or placebo condition. Because the study occurred in a working clinical practice with patients experiencing pain, patients, physicians, and third-party payers expected results and positive outcomes. Third, microcurrent was not the only treatment given to patients. While the microcurrent treatment yielded obvious, immediate, and dramatic differences in the tissue and range of motion, nutritional support, exercise, and manipulation most likely contributed to the speed of recovery and permanence of the results.

The author began teaching others this treatment method in January 1997. Chiropractors, physical therapists, and naturopathic physicians are using it in their clinical practices, and the results look promising. Early reports indicate that the study results are reproducible.

CONCLUSION

Head, neck, and face pain caused by myofascial trigger points has been difficult to treat with traditional trigger point therapy. Microcurrent treatment delivered using graphite/vinyl gloves and specific microcurrent frequencies has produced significant improvements in a refractory group of patients. The results are encouraging and deserving of further study.

REFERENCES

1. Travell JG, Simons DG. *Myofascial Pain and Dysfunction: The Trigger Point Manual, Vol. 1: The Upper Body*. Baltimore: Williams & Wilkins; 1983.
2. Starlanyl D. *Fibromyalgia & Chronic Myofascial Pain Syndrome. A Survival Manual*. Oakland, CA: New Harbinger Publications; 1996.
3. Selye H. *Hans Selye, The Stress of My Life*. New York: Van Nostrand Reinhold; 1975.
4. Cheng N. The effect of electric currents on ATP generation, protein synthesis, and membrane transport in rat skin. *Clin Orthop*. 1982;171:264-272.

5. Manley Tehan I. *Microcurrent Therapy, Universal Treatment Techniques and Applications*. Corona, CA: Manley and Associates; 1994.
6. Rowley BA, McKenna JM, Wolcott LE. The use of low level electric current for the enhancement of tissue healing. *ISA BM*. 1974;74322:111-114.
7. Morgareidge KR, Chipman MR. Microcurrent therapy. *Phys Ther Today*. Spring 1990:50-53.
8. Mercola JM, Kirsch D. The basis for microcurrent electrical therapy in conventional medical practice. *J Adv Med*. 1995;8(2):83-97.
9. *Electronic Medical Digest*. San Francisco: Electronic Medical Foundation; 1944-1955.

