

# PAIN MANAGEMENT

A Practical Guide for Clinicians

SIXTH EDITION

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## A Practical Protocol for Electromedical Treatment of Pain

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If there were pharmaceutical products that could control people's physical pains more than 90% of the time and were safe enough to use as often as necessary without causing any significant side effects, physicians would prescribe them often. If those drugs could also calm people who were seriously clinically anxious or depressed, while being safe enough for people who are only a bit stressed, they would be the most widely prescribed drugs on Earth. If those same drugs could also heal broken bones and close wounds, the pharmacies could not possibly stock enough of them.

What if there is something that could do all these things and so much more, but is not a drug? What if there is a treatment that is so safe it could be used daily to control pain and stress-related diseases. What if it is also so inexpensive that once purchased for a fraction of the cost of conventional care, it will cost almost nothing to use? There is. New forms of electromedicine offer all this and more.

Change has always fought its way into the healthcare system slowly. A mere 100 years ago it would have been considered quackery to propose that invisible little germs could cause disease. Even after the discovery of bacteria, for 35 more years most doctors refused to believe that washing their hands before surgery would make much of a difference. Yet progress in medicine occurred as we developed tools to look deeper into the body, and to see smaller particles. We even speak of subatomic particles, such as electrons, which could both cause disease in the form of free radicals and cure known diseases as well as functional disturbances of the body and mind. We have

learned to appreciate the power of physics in our lives with convenient technologies such as microwave ovens and cellular telephones. Today, our daily lives are increasingly more influenced by electronics than chemistry.

As we begin this new millennium, we rely on various forms of technology to diagnose our patients, both locally through an ever-increasing armamentarium of devices, and even over long distance with telemedicine. But we also can treat our patients with new technologies for a variety of disorders with remarkable and unprecedented safety and efficacy.

Most systems of healthcare have historically been based on biophysics. Acupuncture is an obvious example. Chinese call the electrical properties of life *Chi* energy, Japanese call it *Ki*, Indians call it *Prana*, and chiropractors call it "innate intelligence." Even homeopathy is based on the energetic residual of the chemical after it has been so diluted that chemists question its continued existence. Western allopathic medicine stands alone in reliance on synthetic chemical treatments and invasive procedures, many of which impose a risk worse than the disease for which it is offered. In fact, conventional medical care is the third leading cause of death in the United States with at least 225,000 people dying annually from iatrogenic conditions (Starfield, 2000).

Change takes time in medicine as in any established system. There are strong controlling economic influences and long-standing institutions that will always argue for the status quo. Yet people are more educated and informed about healthcare than ever before. With that comes concern over side effects of dangerous treatments. Why do

we not try the most inexpensive and conservative treatments first, instead of last? When that treatment is based on sound electromagnetic principles, most physicians are surprised to discover that, while not a drug, the results are often more immediate and spectacular than one can imagine. Also, unlike drugs, the results are usually long lasting and cumulative.

While electromedicine has been practiced in some form for thousands of years, research and clinical usage in electromedicine are expanding as never before in history. Perhaps even more than any other therapeutic option, electromedicine is now used routinely by a growing number of practitioners from all of the healthcare professions, as well as by patients themselves at home. Only the United States Food and Drug Administration (FDA) restricts the sale of electromedical devices for use by or on the order of licensed healthcare practitioners. All other countries allow people to purchase therapeutic electromedical devices over the counter for their own personal use. Electromedical modalities are easy to use, relatively safe, and the newer technologies, such as microcurrent electrical therapy and cranial electrotherapy stimulation, have proven efficacy unprecedented by any prior form of medical intervention.

One word of caution, though: Medicine is still a science. Modern electromagnetic therapies have attracted many charlatans. Simply said, not everything is equally safe and effective. Rely only on evidence-based technologies.

## MICROCURRENT ELECTRICAL THERAPY

Joseph M. Mercola and Daniel L. Kirsch (1995) coined the term "microcurrent electrical therapy" (MET) to define a new form of electromedical intervention using biocompatible waveforms.

Patrick DeBock (2000), a physiotherapist at the University of Antwerp in Belgium, recently compared MET with TENS based on the Eight Parameter Law which covers every possible influence in electrotherapy. In his conclusion, DeBock states, "MET has a completely different mechanism, which at this time is not fully understood, but works on a cellular level ... It looks as if TENS is going to lose this competition ... MET will, in most cases, be much more satisfying than TENS because of the longer lasting and more intense effects."

A growing body of research shows the effectiveness of MET to do more than control pain. It can actually accelerate and even induce healing. When a wound is dry, its bioelectric current flow is shut off. Eaglstein and Mertz (1978) have shown moist wounds to resurface up to 40% faster than air-exposed wounds. Falanga (1988) found that certain types of occlusive dressings, like Duo-derm, accelerate the healing of wounds. It is probable that these dressings achieve their effects by promoting a

moist environment (Kulig, Jarski, Drewek, et al., 1991). The moisture may allow endogenously produced current to flow more readily through the injury, and thus promote wound healing. Electrical stimulation of the wound has a similar effect, and also tends to increase the amount of growth factor receptors, which increases the amount of collagen formation (Falanga, et al., 1987).

Electricity was first used to treat surface wounds over 300 years ago when charged gold leaf was found to prevent smallpox scars (Robinson, 1925). There are several recent studies supporting the beneficial effects of treating wounds with an artificial current (Goldin, et al., 1981; Ieran, et al., 1990; Jeran, et al., 1987; Mulder, 1991). Experimental animal wound models in the 1960s demonstrated that electrical intervention results in accelerated healing with skin wounds resurfacing faster, and with stronger scar tissue formation (Assimacopoulos, 1968; Carey & Lepley, 1962).

Assimacopoulos (1968a) published the first human study using direct current for wound healing. He documented complete healing in three patients with chronic leg ulcers due to venous stasis after six weeks of electrical therapy. One year later Wolcott, Wheeler, and Hardwicke (1969) published the most frequently cited work in the history of electrical wound healing. They used direct currents of 200 to 1000  $\mu$ A on 67 patients. Gault and Gatesn (1976) repeated the Wolcott and Wheeler protocol on 76 additional patients with 106 ischemic skin ulcers. Rowley, McKenna, Chase, and Wolcott (1974) studied a group of patients having 250 ischemic ulcers of various types. These included 14 symmetrical control ulcers. The electrically stimulated ulcers had a fourfold acceleration in healing response compared to the controls. Carley and Wainapel (1985) performed one of the only studies on this subject with equal and randomized active and control groups. All of these studies documented significant accelerated healing from electrical stimulation.

One additional consistent observation in these studies was a reversal of contamination in the wounds. Wounds that were initially contaminated with *Pseudomonas* and/or *Proteus* were usually sterile after several days of MET. Other investigators also have noticed similar improvements and encourage the use of this therapy as the preferred treatment for indolent ulcers (Alvarez et al., 1983; Barron & Jacobson, 1985; Kaada, Flatheim, & Woie, 1991; Lundeberg, Eriksson, & Malm, 1992). Additionally, no significant adverse effects resulting from electrotherapy on wounds have been documented (Weiss, et al., 1990). A review of the literature by Dayton and Palladino (1989) shows that MET is clearly an effective and safe supplement to the nonsurgical management of recalcitrant leg ulcers.

Some of these studies used unipolar currents that were alternated between negative and positive based on various criteria. Some researchers initially used negative current

to inhibit bacterial growth and then switched to positive current to promote healing. To date no study has compared this variable of MET. However, there is some compelling basic science research, and one animal study, suggesting that a biphasic waveform, which provides both negative and positive current, may be better in that it both sterilizes the wound and promotes wound healing (Stromberg, 1988; Windsor, Lester, & Herring, 1993).

In the 1960s Robert O. Becker (1985) demonstrated that electrical current is the trigger that stimulates healing, growth, and regeneration in all living organisms. He found that repair of injury occurs in response to signals that come from an electrical control system, and suggested that this system became less efficient as we age.

Becker developed his theory of biological control systems based on concepts derived from physics, electronics, and biology. He postulated that the first living organisms must have been capable of self-repair, otherwise they never would have survived. The repair process requires a closed-loop system. A specific signal is generated, called the current of injury, which causes another signal to start repair. The injury signal gradually decreases over time with the repair process, until it finally stops when the repair is complete. Such a primitive system does not require demonstrable consciousness or intelligence. In fact, many animals actually have a greater capacity for healing than humans.

Science has amassed a vast amount of information on how the brain and nervous system work. Most of this research involves the action potential as the sole mechanism of the nerve impulse. This is a very sophisticated and complex system for the transfer of information. It is helpful to compare this conceptualized concept of the nervous system to a computer.

The fundamental signal in both the computer and the nervous system is a digital one. Both systems transfer information represented by the number of pulses per unit of time. Information also is coded according to where the pulses originate, where they go, and whether or not there is more than one channel of pulses feeding into an area. All our senses (e.g., smell, taste, hearing, sight, and touch) are based on this type of pulse system. Like a computer, the nervous system operates remarkably fast and can transfer large amounts of information as digital on-and-off data.

It is unlikely that the first living organisms had such a sophisticated system. Becker believes they must have had a much simpler mechanism for communicating information because they did not need to transmit large amounts of sophisticated data. Accordingly, they probably used an *analog* system. An analog system works by means of simple DC currents. Information in an analog system is represented by the strength of the current, its direction of flow, and slow wavelength variations in its strength. This is a much slower system than the digital model. However, the analog system is extremely precise and works well for its intended purpose.

Becker theorizes that primitive organisms used this analog type of data transmission and control system for repair. He postulates that we still have this primitive nervous system in the perineural cells of the central nervous system. These cells comprise 90% of the nervous system. The perineural cells have semiconductor properties that allow them to produce and transmit nonpropagating DC signals. This system functions so vastly differently from the "all or none" law of propagation of the nerve action potentials that Becker called this the fourth nervous system.

This analog system senses injury and controls repair. It controls the activity of cells by producing specific DC electrical environments in their vicinity. It also appears to be the primary primitive system in the brain, controlling the actions of the neurons in their generation and receipt of nerve impulses. Accordingly, as knowledge of this aspect of our nervous system is uncovered, another mystery of brain physiology may be explained, including the regulation of our consciousness and decision-making processes. Given this understanding, the application of the correct form of electrical intervention is a powerful tool for treating pain, initiating the endogenous mechanisms for healing, and altering states of consciousness.

Chang, Van Hoff, Bockx, et al. (1982) proposed another mechanism for MET. Their research showed that microcurrent stimulation increased adenosine triphosphate (ATP) generation by almost 500%. Increasing the level of current to milliampere levels actually decreased the results. Microcurrent also was shown to enhance amino acid transport and protein synthesis in the treated area 30 to 40% above controls.

It would be helpful to review the cellular nature of an injury to fully appreciate the importance of Chang's research. Becker (1985) has shown that trauma will affect the electrical potential of cells in damaged tissues. Initially the injured site has a much higher resistance than that of the surrounding tissue. Basic physics dictates that electricity tends to flow toward the path of least resistance. Therefore, endogenous bioelectricity avoids areas of high resistance and takes the easiest path, generally around the injury. The decreased electrical flow through the injured area decreases the cellular capacitance (Windsor, et al., 1993). As a result, healing is actually impaired. This may be one of the reasons for inflammatory reactions. Pain, heat, swelling, and redness are the characteristics of inflamed tissues. Electricity flows more readily through these hot inflammatory fluids.

The correct microcurrent application to an injured site augments the endogenous current flow. This allows the traumatized area to regain its capacitance. The resistance of the injured tissue is then reduced, allowing bioelectricity to enter the area to reestablish homeostasis. Therefore, microcurrent electrical therapy can be viewed as a catalyst helpful in initiating and sustaining the numerous chemical and electrical reactions that occur in the healing process.

When a muscle experiences trauma it goes into spasm to protect itself. This decreases its blood supply, reducing the amount of oxygen and nutrients that reach it. The decreased circulation causes an accumulation of metabolic waste products. This acts as noxious input resulting in pain.

Adenosine triphosphate is an essential factor in the healing process. Large amounts of ATP, the cell's main energy source, are required to control primary functions such as the movement of vital minerals, like sodium, potassium, magnesium, and calcium, into and out of the cell. It also sustains the movement of waste products out of the cell. Injured tissues are deficient in ATP.

As MET restores circulation and replenishes ATP, nutrients can again flow into injured cells and waste products can flow out. This is necessary for the development of healthy tissues. As ATP provides the energy tissues require for building new proteins, it also increases protein synthesis and membrane transport of ions.

## SURVEY RESULTS

Two surveys were recently conducted on a total of 3000 people using Alpha-Stim™ technology employing the combined treatment protocols of MET and CES as presented here.

Healthcare practitioners completed a post-marketing survey of 500 patients in 1998 (Kirsch, 1999). There were 174 males, and 326 females, ranging from 5 to 92 years old. Outpatients accounted for 479 of the forms, while 21 were hospitalized at the time of treatment. Treatment was satisfactorily completed by 197 (41%) of the patients with 207 (43%) still receiving treatment at the time of the survey.

Ten patients discontinued treatment because they thought it was not helping them, and three more discontinued due to undesirable side effects. An additional 13 terminated treatment when their insurance ran out and they could no longer pay for treatment; 20 patients moved out of the area while treatment was in progress or discontinued treatment for other, unstated reasons.

Negative adverse effects were all rare, mild, and self-limiting, with 472 (94.4%) reporting none. Six (1.2%) reported vertigo as a side effect and 2 (0.4%) reported nausea, either of which normally occurs when the current is set too high or in patients with a history of vertigo. Only 3 (0.6%) reported skin irritation, and 1 (0.2%) each reported anger, a metallic taste, a heavy feeling, or intensified tinnitus. These generally receded or disappeared as soon as the current was reduced.

The most important aspect of this survey was the results reported as a degree of improvement in the seven symptoms present in most patients for which MET and/or CES is prescribed; i.e., pain, anxiety, depression, stress, insomnia, headache, and muscle tension. The treatment outcome was broken down into response categories beginning with [it made the condition] "Worse," and progressing up to "Complete" improvement or cure. As in pharmaceutical studies, a degree of improvement of 25% or more was considered to be clinically significant. The data for all 500 patients reporting on multiple symptoms are summarized in Table 61.1.

In addition, 2500 patients were surveyed through a form attached to warranty cards (Smith, 2001); 1411 (72.40%) of the patients were female; ages ranged from 15 to 92 years old with a mean of 50.07 years. The length of use ranged from the minimum of 3 weeks which was

**TABLE 61.1**  
**Results of Using Alpha-Stim™ Technology for MET and CES as Reported by Healthcare Practitioners**

Condition	N	Worse	No Change	Slight < 24%	Fair 25–49%	Moderate 50–74%	Marked 75–99%	Complete 100%	Significant > 25%
Pain	286	1	5	20	48	77	108	27	260
		0.35%	1.75%	6.99%	16.78%	26.92%	37.76%	9.44%	90.91%
Anxiety	349	0	8	14	39	89	181	18	327
		0.00%	2.29%	4.01%	11.17%	25.50%	51.86%	5.16%	93.70%
Depression	184	0	8	11	31	38	82	14	165
		0.00%	4.35%	5.98%	16.85%	20.65%	44.57%	7.61%	89.67%
Stress	259	0	6	12	37	70	124	10	241
		0.00%	2.32%	4.63%	14.29%	27.03%	47.88%	3.86%	93.05%
Insomnia	135	0	16	12	17	34	45	11	107
		0.00%	11.85%	8.89%	12.59%	25.19%	33.33%	8.15%	79.26%
Headache	151	1	8	6	25	32	63	16	136
		0.66%	5.30%	3.97%	16.56%	21.19%	41.72%	10.60%	90.07%
Muscle tension	259	2	6	6	42	76	111	16	245
		0.77%	2.32%	2.32%	16.22%	29.34%	42.86%	6.18%	94.59%

Note: Total N = 500 patients with multiple symptoms.

the only inclusion criterion, to a maximum of 5 years in two cases. The average period of use reported was 14.68 weeks or approximately 3.5 months. Of 1949 primary pain patients, 1813, or 93.02% rated their improvement as significant, and these findings correlate well with the physicians' survey of 500 patients where 90.91% of 286 pain patients were observed to have significant improvement. The data for all 2500 patients reporting on multiple symptoms are summarized in Table 61.2.

## BASIC TREATMENT PROTOCOL FOR MICROCURRENT ELECTRICAL THERAPY (MET)

The following section is intended as a practical guide for clinicians to utilize the principles discussed in this chapter. The methods of treatment provided herein have been developed by the author based on 3 decades of experience in electromedicine. The reader is cautioned to remember that not all brands of microcurrent devices are equally efficacious. Always check the manufacturer's specific instructions before using a medical device. As medicine is not an exact science, the author cannot assume responsibility for the clinical efficacy of, or liability for, the methods and treatments found in this text.

### STEP ONE: HISTORY AND BRIEF EXAM

It is important to take a comprehensive history and do a brief analysis of the patient's current condition before beginning each session of MET treatment. A diagnosis is not enough. One should determine when the pain first presented, its frequency, duration, intensity, limitations-of-motion, positions which exacerbate the pain, and any precipitating factors. Ask about the specifics of previous treatments and details of *all* surgical scars and traumatic injuries. Microcurrent electrical therapy is a very holistic procedure. It may be necessary to clear the body of any and all electrical "blocks" in order to achieve the best results. Even brief 10- to 20-second treatments of other problems and/or old injuries may reverse a refractory case.

Immediately before each treatment determine the patient's *present* pain level, and positions that exacerbate the pain. Ask the patient to rate his or her present pain on a scale of 0 (no pain) to 10, with 10 being excruciating, debilitating pain. Tell the patient to consider 10 as "the worst *this condition* has been." Also note any immediate limitations-of-motion, positive orthopedic and neurologic test findings, and objective signs of psychological distress. Because the results of MET can be seen after only a minute or so of treatment in most people, these indicators are necessary reference parameters to determine effectiveness throughout a single treatment session.

### ADJUST THE SETTINGS

Use 0.5 Hz frequency most of the time. It is unusual ever to need other frequency settings. However, if 0.5 Hz does not work, and a number of electrode placements sites have been attempted, try 1.5 Hz; 100 Hz sometimes produces faster results when treating inflammatory articular problems (e.g., arthritis, bursitis, tendonitis, etc.). However, 100 Hz does not contribute much to long-term results so treatment should always be completed using a low frequency. Set the current intensity level at the highest comfortable position, which is usually 500 to 600  $\mu$ A for probes, although sometimes less for the silver electrodes used with MET. Do not use standard TENS electrodes except in the initial treatment of hypersensitive patients. Carbon TENS electrodes have a resistance of about 200 ohms, while silver electrodes have a resistance of about 20 ohms. Only silver electrodes will work effectively with MET devices.

When using probes, first affix new felt electrodes and saturate them with an appropriate electromedical conducting solution. Then apply firm pressure, but less than what would cause more pain. Tap water does not work well in some places anymore because of recent advances in desalination during water processing. Saline solution may be used if a conducting solution is not available.

For extremely hypersensitive people, such as fibromyalgia patients, it is better to start with a minimal amount of current. Even low-level MET currents may be uncomfortable in some patients. For these patients it may be necessary to initially reduce the conductivity by using more resistive electrodes. Over the course of a few weeks, the therapeutic dosage of electricity can gradually be increased. Start with standard carbon electrodes, followed by silver electrodes, then probes with tap water, until the area is desensitized enough to use probes with conducting solution. Fortunately, this is rarely necessary. Most people will not even feel MET stimulation at a current of 600  $\mu$ A.

### BASIC TREATMENT STRATEGY

There are only a few principles one must remember when treating patients with MET. The patient should be in a relaxed position to receive maximum beneficial effects. For example, do not let patients help with the treatment of their hands by holding up their arms, which would cause the arm muscles to tense. In this case, it is better to place both hands on a table.

The most important variable is the position of the probes, or silver electrode pads. Place the probes, or pads, in such a way that if a line were drawn between them, the line would travel through the problem area. Keep in mind that the body is three-dimensional. Therefore, many possible lines can be drawn through the problem area. Some lines will work much better than others. *The correct electrode location is the one that works!* However, the one

**TABLE 61.2**  
**Results of Using Alpha-Stim™ Technology for MET and CES for at Least 3 Weeks as Reported by Patients**

Condition	N	Slight < 24%	Fair 25–49%	Moderate 50–74%	Marked 75–100%	Significant > 25%
Pain (all cases)	1949	136 6.98%	623 31.97%	741 38.02%	449 23.04%	1813 93.02%
Back pain	403	20 4.96%	109 27.05%	157 38.96%	117 29.03%	383 95.04%
Cervical pain	265	18 6.79%	69 26.04%	125 47.17%	53 20.00%	247 93.21%
Hip/leg/foot pain	160	6 3.75%	43 26.88%	53 33.13%	58 36.25%	154 96.25%
Shoulder/arm/hand pain	150	13 8.67%	41 27.33%	63 42.00%	33 22.00%	137 91.33%
Carpal tunnel syndrome	25	0 0.00%	5 20.00%	17 68.00%	3 12.00%	25 100.00%
Arthritis pain	188	11 5.85%	51 27.13%	88 46.81%	38 20.21%	177 94.15%
TMJ pain	158	17 10.76%	60 37.97%	60 37.97%	21 13.29%	141 89.24%
Myofascial pain	62	6 9.68%	18 29.03%	18 29.03%	20 32.26%	56 90.32%
RSD	55	10 18.18%	16 29.09%	19 34.55%	10 18.18%	45 81.82%
Fibromyalgia (alone)	142	13 9.15%	53 37.32%	52 36.62%	24 16.90%	129 90.85%
Fibromyalgia (with other)	363	33 9.09%	131 36.09%	152 41.87%	47 12.95%	330 90.91%
Migraine	118	2 1.69%	49 41.53%	30 25.42%	37 31.36%	116 98.31%
Headaches (all other)	112	20 17.86%	30 26.79%	24 21.43%	38 33.93%	92 82.14%
Psychological (all cases)	723	61 8.44%	175 24.20%	237 32.78%	250 34.58%	662 91.56%
Anxiety (alone)	128	13 10.16%	29 22.66%	42 32.81%	44 34.38%	115 89.84%
Anxiety (with other)	370	33 8.92%	85 22.97%	122 32.97%	130 35.14%	337 91.08%
Anxiety/depression	58	3 5.17%	19 32.76%	19 32.76%	17 29.31%	55 94.83%
Depression (alone)	53	7 13.21%	11 20.75%	23 43.40%	12 22.64%	46 86.79%
Depression (with other)	265	29 10.94%	61 23.02%	93 35.09%	82 30.94%	236 89.06%
Stress	123	6 4.88%	30 24.39%	39 31.71%	48 39.02%	117 95.12%
Chronic fatigue	50	3 6.00%	30 60.00%	10 20.00%	7 14.00%	47 94.00%
Insomnia	163	10 6.13%	47 28.83%	47 28.83%	59 36.20%	153 93.87%

Note: Total N = 2500 patients with multiple symptoms. From consecutive warranty cards analyzed as of July 2000.

that works may be transient, working well one day, but ineffective another day. As the problem begins to resolve, the electrode locations may require frequent adjustments.

A common mistake made by clinicians familiar with traditional TENS is placing the electrodes on each side of the spine for back pain. This is a two-dimensional

approach. With such a placement, microcurrent will travel just under the skin between the electrodes and never reach the spine. Nor can the electrodes be effectively placed “between the pain and the brain.” These are common placements for TENS electrodes, but MET is not TENS. A better way is to place one electrode next to the spine at the level where the problem is, and the other on the contralateral side, anteriolaterally (front and opposite side). A line drawn between those will go right through the spinal nerves. Next, reverse the sides. Then follow up by doing another set of contralateral placements one spinal level above, and one below the problem to accommodate overlap in the dorsolateral fasciculus.

Always treat bilaterally. Bilateral treatment includes the spinal cord, thereby involving dermatomes, myotomes, and sclerotomes. Also, if the problem is within the axial skeleton and the contralateral side is ignored, there is a good chance that the primary location of a pain problem will be missed. Pain often presents itself on the tense side, which may be compensating for muscular weakness on the other side.

### QUICK PROBE TREATMENTS

When using probes, set the timer on a probe setting, or if one is not available, treat about 10 seconds per site. In other words, move the probes to the next location every 10 seconds. Consider one treatment “set” to be 12 to 20 of these 10-second stimulations, each at a different angle of approach. The first set should take about 2 minutes, but then additional treatment may be done at 1-minute intervals. The patient should be reevaluated between each set.

The protocol involves four steps:

1. First treat in a large “X” manner over a wide area holding the probes so that the current is directed through the problem area. An example of this strategy for knee pain would be to first make the large X by treating from the medial, superior thigh to the lateral foot, then lateral at the hip to the medial foot.
2. Treat with smaller Xs, or a “star” (\*) closer and directly around the involved knee (e.g., two obliques, one or two medial–lateral, one or two anterior–posterior, etc.).
3. Treat the opposite knee for at least 20 seconds (one X), even if it is asymptomatic.
4. Connect the two knees by placing a probe on each knee at least four times.

The above example takes 2 minutes. A big X beyond the area (20 seconds), a star through the chief complaint (40 seconds), treat the opposite side with one small X (20 seconds), and connect the two sides (40 seconds). Then reevaluate the pain based on the original criteria.

If the pain is gone, stop for the day. If it is reduced, ask the patient to point to where it hurts with one finger and treat for another minute or so directly through the area of pain, which may have moved after the original 2-minute treatment.

Think in terms of symmetry. Look, palpate, and otherwise examine areas above, below, and to the left and right of the primary area undergoing treatment. Always treat the opposite side and connect both sides.

### SILVER SELF-ADHESIVE ELECTRODES

These are used following the same strategy as the probes, except for a longer period of time. The probes and brief electrode treatments assume MET is working as a catalyst for the patient’s own bioelectrical system, whereas keeping electrodes in place can be viewed as using MET to augment endogenous bioelectricity. For optimum results, silver electrodes also may be moved around the problem area. Whereas the probes are used for 10 seconds a site, silver electrodes should be left at each location for *at least* 5 to 10 minutes. Some cases will require an hour or even several hours of stimulation daily. Accordingly, silver electrodes are best used for home care. However, if brief stimulation works, do not continue treatment at that session. More is not better when using MET technology to manage pain!

### WHEN TO STOP

Reevaluate the patient after the 2-minute protocol using the original criteria. It is not enough to ask if the patient feels better, ask for a specific percentage of how much better. If the patient has difficulty with a 0-to-10 scale, to facilitate communication, ask, “If you had a dollar’s worth of pain when we began, how many cents do you have left?” Also, reexamine for improvement in objective signs, such as range-of-motion increases, etc. Stop when the pain is completely gone, or when the improvement has reached a plateau after several treatment sets. Continuing to treat the area at this time may cause the pain to return! If the pain is gone, it is far better to stop treatment for that day even if the patient only had 1 or 2 minutes of treatment.

If the patient can no longer identify any pain, but complains of stiffness, this indicates that it is time to stop treatment for the day. Microcurrent may not reduce residual stiffness. Post-pain stiffness usually wears off by itself. Yoga, Tai Chi, or simple stretching exercises are good means of controlling chronic stiffness.

Although most patients will have an immediate response to treatment, in some the effects will be delayed, continuing to improve over a day or two after the treatment. In these patients relief will generally occur 1 to 3 hours post-treatment or even as late as the



next morning. Some patients will experience a cumulative effect, continuing to improve over time. Patients who experience a delayed effect are more difficult to treat due to lack of immediate feedback. Usually, patients who experience a delayed effect from microcurrent treatment also have a delayed effect with anesthetics. Ask the nonresponsive patient if his or her dentist had to wait more than 10 minutes after injecting anesthetic prior to doing dental procedures. Because treating patients who exhibit delayed responses can be viewed as a type of “blind” treatment, one must rely on experience with other patients who exhibited an immediate response in order to develop the skills to treat those few who have a delayed response. A post-treatment diary is also helpful in analyzing the response of these patients.

### FOLLOW-UP

Most patients should be given at least three to seven treatments before evaluating their responses to microcurrent electrical therapy. It helps to explain to the patient that the effects of MET treatment are cumulative. Like antibiotics, one must take several doses over a period of time to get results. Although results will usually be seen during or subsequent to the first treatment, the longevity of the results can only be evaluated after a series of treatments. Fortunately, most patients will experience long-lasting results. However, in some cases the results will plateau to a similar time period regardless of treatment. For example, a patient may only get 1 or 2 days of relief no matter what combination of treatment strategies is employed. For these, and cases of severe pathology, the effectiveness may be only short-lived, so a MET device should be prescribed for home care. After an initial series of up to ten clinical treatments, a good rule of thumb is to prescribe a unit for anyone with a chronic condition who requires more than one or two palliative treatments per month, and for patients who have progressive pathologies. When used at home, after an initial series of 1 or 2 weeks of daily treatments, treatment every other day usually provides better results than daily treatment.

### TIPS FOR LIMITED OR POOR RESULTS

While a good MET device will be at least somewhat efficacious on more than 90% of the population when used correctly, MET will not work for everyone. In cases where there are no results at all, a few things should be considered. Dehydrated patients may not respond well. Patients should be advised to drink at least eight to ten glasses of water daily. Nutrition is certainly a factor. A poor diet does not provide the necessary building blocks to reinstate homeostasis.

Also, preliminary observations suggest that people who have had a significant exposure to strong electrical current may be poor candidates for MET. This means that they either have been held by electrical current at some time in their life, or have been treated with mA TENS or similar modalities for a prolonged period of time, usually years. There have even been a few reports of failures in patients who were struck by lightning. Brief exposure to very high levels of electricity is not as bad as longer exposure to any level of electricity. Such patients need to be treated for a longer period of time.

Aside from hydration and nutrition and electrical shock, the primary reversible reason patients fail to respond to treatment is that they have some sort of a blockage somewhere on or in their body that is resisting endogenous electrical flow. This is usually something superficial, like a scar or old injury. It need not be anywhere near the patient’s primary problem. Identify *all* scars by taking a very thorough, persistent history, and examining the patient completely. All scars are important no matter how old or how far they are from the chief complaint. Scar tissue impedes the systemic flow of endogenous bioelectricity because it is a poor conductor of electricity. Accordingly, scar tissue may interfere with the patient’s entire bioelectrical system. If scars are present they should be treated with silver electrodes for 10 minutes per scar, at least four times. Simply cover the scars with the electrodes, or for large scars, place the electrodes on the ends of the scars. This may be done 4 days in a row or there can be a short interval of up to a few days between the treatments. Some people report that it helps to repeat this procedure after a month or so.

During treatment for scars the person may experience a significant surge of energy. This can be viewed as if an electrical “bioresistor” has broken down, reestablishing the normal flow of bioelectricity. After scar therapy, patients will often report feeling half their age. Because people have nothing with which to compare their life experiences, they usually attribute the subtle effects of scars on their electrical system as normal aging. Be aware that this treatment will often also increase pain, because the whole body and mind “wake up,” including the painful part. However, in nearly all cases, when this happens the painful area can then be successfully treated. Always schedule enough time to treat the pain after a scar treatment, so the patient will not need to endure even a temporary increase in pain.

If all the scars are treated and there are still no results, or if there are poor results, a few other options still exist. Question the patient about old injuries that may not have healed properly. These also could be electrical blocks and should be approached in the same way as scars. Consider treating the primary complaint at a lower current setting of 100  $\mu$ A with silver electrodes for 60

minutes or more. Slightly higher pulse repetition rates (e.g., 1.5 Hz) may produce results in some people when the 0.5 Hz fails, but this is rare. For more information about treating scars, or how to determine which scars to treat, physicians and dentists may contact the American Academy of Neural Therapy through their Web site at [www.neuraltherapy.com](http://www.neuraltherapy.com).

**SAMPLE PROTOCOLS**

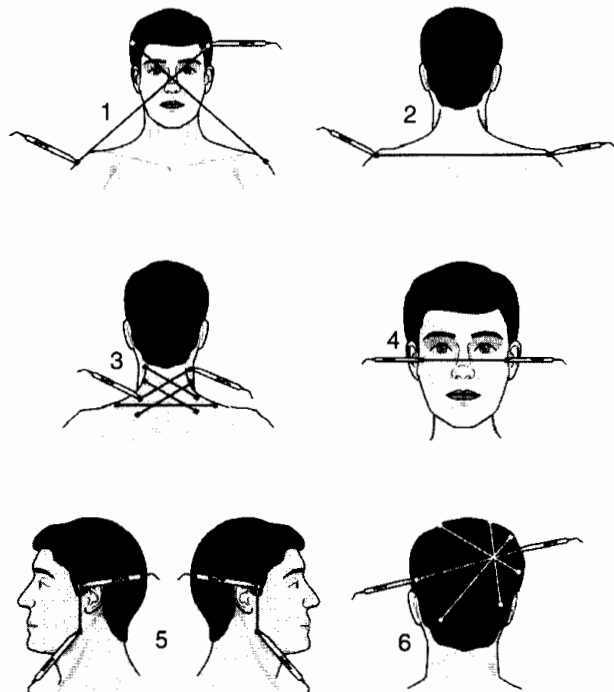
The following illustrated sample protocols may be used as a guide for treatment using MET.

**HEAD PAIN PROTOCOL**

**SAMPLE 1 (See Figure 61.1): Head Pain**

*Include the temporomandibular joint (TMJ), neck, and shoulders.*

1. Above the ear to the tip of the contralateral shoulder. Reverse sides.
2. Across the shoulders by treating bilaterally across the distal tips of the acromions.
3. A few "X" patterns across back of neck.
4. From one TMJ to the other.
5. Temple to ipsilateral masseter muscle. Reverse sides.
6. About 1 minute through the primary area of involvement.



**FIGURE 61.1** Head pain protocol.

Balance out contralateral side by treating any mirror areas not already covered.

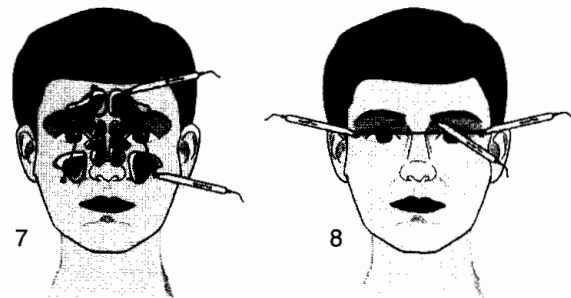
*Note: Reduce the current as necessary to avoid vertigo. Treating near the eyes may cause the patient to see flashing lights due to stimulation of optic nerve. Patient may also taste metal fillings when treating across oral cavity. None of these conditions is harmful.*

**SINUS AND OCULAR PAIN**

**SAMPLE 2 (See Figure 61.2): Sinus and Ocular Pain**

*Begin sinus and ocular pain treatment using the above protocol for head pain.*

7. Treat sinuses when indicated, above and below eyes, or from side to side (see notes in head pain section). The patient should be able to breathe more clearly immediately after treatment.
8. For ocular headaches, treat behind eyes by placing probes on each temple, lateral to the lateral canthus of the eyes, and across each eye (one at a time) at the bridge of the nose to the lateral canthus.



**FIGURE 61.2** Sinus and ocular pain protocol.

**TEMPOROMANDIBULAR DISORDER**

**SAMPLE 3 (See Figure 61.3): Temporomandibular Disorder (TMD)**

*Begin temporomandibular disorder treatment using the above protocol for head pain.*

7. A star pattern across TMJ. Reverse sides.
8. Connect the TMJ with the sternocleidomastoides (SCM) muscles, below the mastoid, and along the clavicular and sternal branches. Reverse sides.

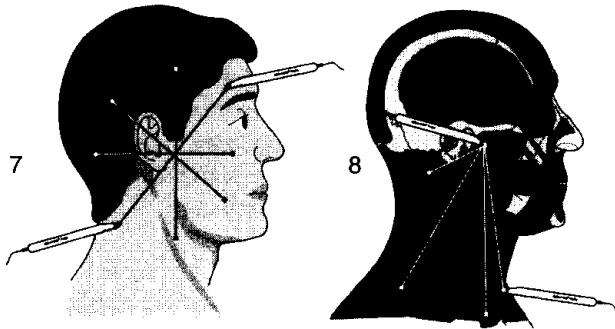


FIGURE 61.3 Temporomandibular disorder (TMD) pain protocol.

to the webs between the fingers in addition to local treatment at the wrist.

3. Treat the area corresponding to the area of pain on the other upper extremity for 20 to 40 seconds.
4. Connect the two upper extremities by placing one probe on each in several symmetrical places encompassing the pain area for 40 seconds to 1 minute.

**LOWER EXTREMITY PAIN PROTOCOL**

**UPPER EXTREMITY PAIN PROTOCOL**

**SAMPLE 4 (See Figure 61.4): Upper Extremity**

1. First make the large “X” by treating from the anterior shoulder to the posterior hand, and the posterior shoulder to the anterior hand.
2. Complete 40 seconds to 1 minute of smaller Xs closer to and directly around the shoulder, elbow, wrist, hand, or other area of pain. For carpal tunnel syndrome (CTS) or repetitive strain injury (RSI), treat superior to the elbow

**SAMPLE 5 (See Figure 61.5): Lower Extremity**

1. First make the large “X” by treating from the medial, superior thigh to the lateral foot, then the lateral hip to the medial foot.
2. Complete 40 seconds to 1 minute of smaller Xs closer to and directly around the hip, knee, ankle, foot, or other area of pain.
3. Treat the area corresponding to the area of pain on the other lower extremity for 20 to 40 seconds.
4. Connect the two lower extremities by placing one probe on each in several symmetrical places encompassing the pain area for 40 seconds to 1 minute.

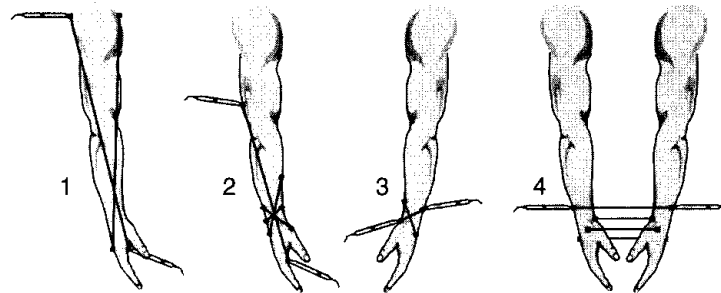


FIGURE 61.4 Upper extremity pain protocol.

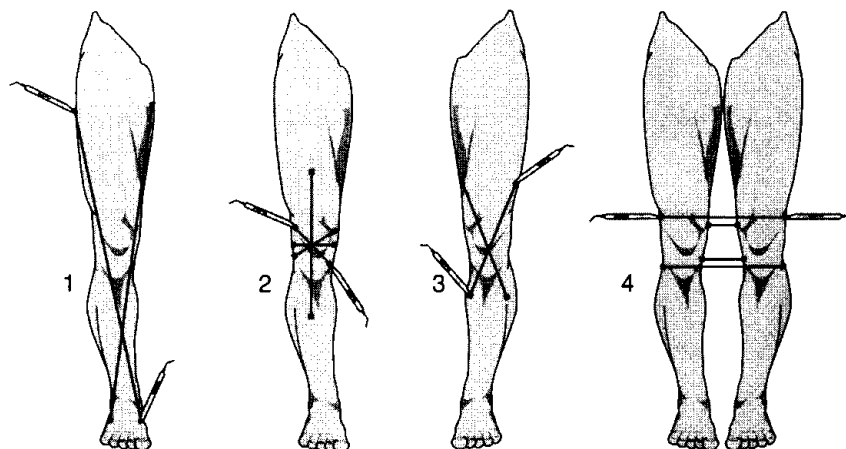


FIGURE 61.5 Lower extremity pain protocol.

**BACK PAIN PROTOCOL**

**SAMPLE 6 (See Figure 61.6): Back Pain**

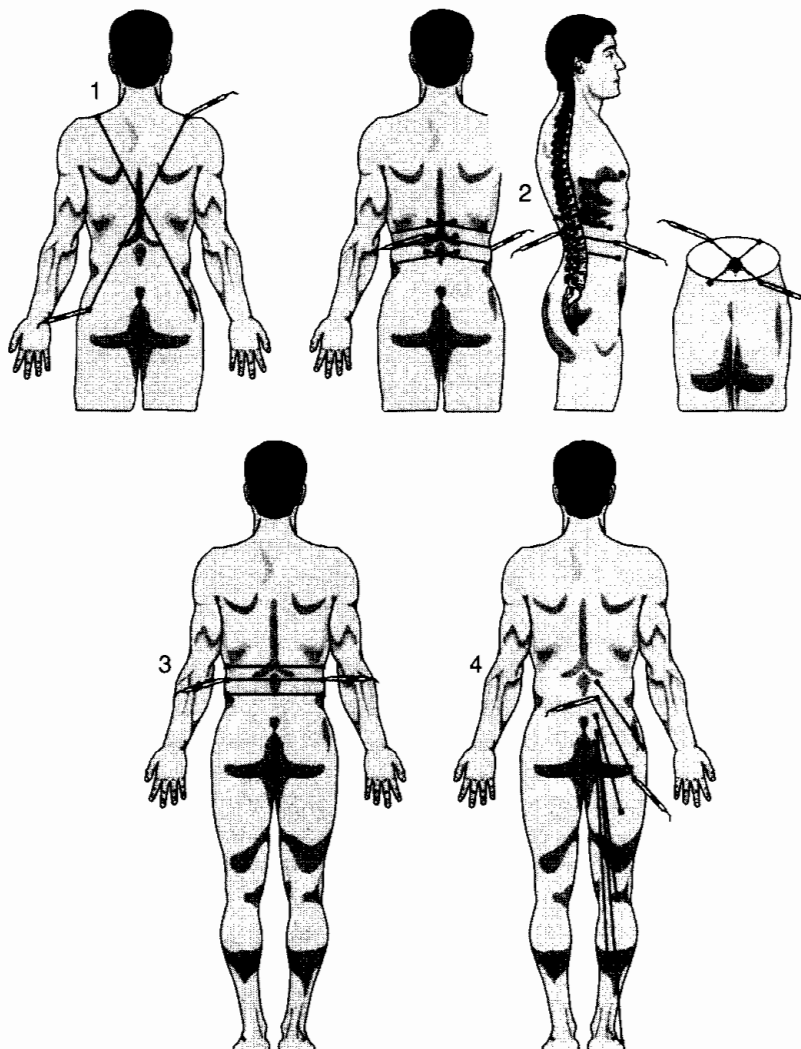
1. Anterior between the trapezius muscle and the clavicle connected to the contralateral posterior hip. Reverse sides.
2. Then place one probe next to the spine at the level where the problem is, and the other on the contralateral side, anteriolaterally (front and opposite side). A line drawn between those will go right through the spinal nerves. Reverse the sides. Repeat contralateral placements one spinal level above, and one below the problem.
3. Also treat across the vertebrae, from each side of the body through the problem area, above, and below.
4. For low back pain with sciatic radiculitis, connect various levels from L3 to L5 about 1 inch lateral to the spine with the ipsilateral, posterior

leg at 4- to 6-inch intervals with the last, most inferior placement at the lateral foot (or just past where the pain radiates).

**CRANIAL ELECTROTHERAPY STIMULATION**

Cranial electrotherapy stimulation (CES) is the application of low-level, pulsed electrical currents (usually not exceeding 1 mA), applied to the head for medical and/or psychological purposes. It is used primarily to treat both state (situational) and trait (chronic) anxiety, depression, insomnia, stress-related and drug addiction disorders, but it is also proving indispensable for treating pain patients (Kirsch & Smith, 2000; Lichtbroun, Raicer, & Smith, 2001; Thuile & Kirsch, 2000).

Drs. Leduc and Rouxeau of France were the first to experiment with low-intensity electrical stimulation of the brain in 1902. Initially, this method was called electrosleep



**FIGURE 61.6** Back pain protocol.

as it was thought to be able to induce sleep. Since then, it has been referred to by many other names, the most popular being transcranial electrotherapy (TCET) and neuroelectric therapy (NET). Research on using what is now referred to as cranial electrotherapy stimulation (CES) began in the Soviet Union during the 1950s.

Cranial electrotherapy stimulation is a simple treatment that can easily be administered at any time. The current is applied by easy-to-use clip electrodes that attach on the ear lobes, or by stethoscope-type electrodes placed behind the ears. In the 1960s and early 1970s, electrodes were placed directly on the eyes because it was thought that the low level of current used in CES could not otherwise penetrate the cranium. This electrode placement was abandoned more than 20 years ago. Recent research has shown that from 1 mA of current, about 5  $\mu\text{A}/\text{cm}^2$  of CES reach the thalamic area at a radius of 13.30 mm which is sufficient to affect the manufacture and release of neurotransmitters (Ferdjallah, Bostick, Jr., Francis, Jr., & Barr, 1996).

Anxiety reduction is usually experienced during a treatment, but may be seen hours later, or as late as 1 day after treatment. Although in some people it may require a series of 5 to 10 daily treatments to be effective. Severe depression often takes up to 3 weeks to establish a therapeutic effect.

Cranial electrotherapy stimulation leaves the user alert while inducing a relaxed state. Psychologists call this an *alpha state*. The effect differs from pharmaceutical treatment in that people usually report feeling that their bodies are more relaxed, while their minds are more alert. Most people experience a feeling that their bodies are lighter, while thinking is clearer and more creative. A mild tingling sensation at the electrode sites also may be experienced during treatment. The current should never be raised to a level that is uncomfortable. One 20-minute session is often all that is needed to effectively control anxiety for at least a day, and the effects are usually cumulative. If the patient can only tolerate a small amount of current (< 200  $\mu\text{A}$ ) due to vertigo or nausea, more time is required. Cranial electrotherapy stimulation also may be used as an adjunct to anxiolytic or antidepressive medication, but the dosage of medication should then be reduced by approximately one third. It is also proven to be an effective complimentary treatment along with psychotherapy, biofeedback training, and surgical anesthesia (Kirsch, 1999). For people who have difficulty falling asleep, CES should be used in the morning to avoid the possibility of increased alertness that may interfere with sleep.

Most people can resume normal activities immediately after treatment. Some people may experience a euphoric feeling, or a state of deep relaxation that may temporarily impair their mental and/or physical abilities for the performance of potentially hazardous tasks, such

as operating a motor vehicle or heavy machinery, for up to several hours after treatment.

At present, there are over 100 research studies on CES in humans and 20 experimental animal studies (Kirsch, 1999). No significant lasting side effects have ever been reported. Occasional self-limiting headache (1 out of 450), discomfort or skin irritation under the electrodes (1 out of 811), or lightheadedness may occur. A rare patient with a history of vertigo may experience dizziness for hours or days after treatment.

Most cranial electrotherapy stimulators are limited to 600  $\mu\text{A}$ . To put this into perspective, it takes one half of an ampere to light an ordinary 60-watt light bulb. To truly compare the work done per second by these two different currents, we must multiply the currents by the respective voltages that drive them. The product of current  $\times$  voltage is a measure of the rate of generation of energy, and is referred to as the power output. By definition, when a device outputs 1 ampere of current with a 1-volt driving force, the power output of the device is 1 watt. Therefore, a device producing a maximum output of 600  $\mu\text{A}$  is limited to about 11,000 times less power than the light bulb:  $(600/1,000,000)$  amperes  $\times$  9 volts = 0.0054 watts. Some people do not even feel this amount of current.

As in many areas of biology and therapy, the evidence of CES effectiveness is empirical. It is generally believed that the effects are primarily mediated through a direct action on the brain at the limbic system, the hypothalamus and/or reticular activating system (Brotman, 1989; Gibson & O'Hair, 1987; Madden & Kirsch, 1987). The primary role of the reticular activating system is the regulation of electrocortical activity. These are primitive brainstem structures. The functions of these areas and their influence on our emotional states were mapped using electrical stimulation. Electrical stimulation of the periaqueductal gray matter has been shown to activate descending inhibitory pathways from the medial brainstem to the dorsal horn of the spinal cord, in a manner similar to  $\beta$ -endorphins (Ng, Douthitt, et al., 1975; Pert, Dionne, Ng, et al., 1981; Salar, Sob, et al., 1981). Cortical inhibition is a factor in the Melzack-Wall Gate Control theory (Melzack, 1975). Toriyama (1975) suggested it is possible that CES may produce its effects through parasympathetic autonomic nervous system dominance via stimulation of the vagus nerve (CN X). Taylor (1991) added other cranial nerves such as the trigeminal (CN V), facial (CN VII), and glossopharyngeal (CN IX). Fields, Tacke, and Savana (1975) showed that electrocortical activity produced by stimulation of the trigeminal nerve is implicated in the function of the limbic region of the midbrain affecting emotions. Substance P and enkephalin have been found in the trigeminal nucleus, and are postulated to be involved in limbic emotional brain structures (Hokfelt, Ljungdahl, et al., 1977). The auditory-vertigo nerve (CN VIII) must also be affected by CES, accounting for the dizziness one

experiences when the current is too high. Ideally, CES electrodes are placed on the ear lobes because that is a convenient way to direct current through the midbrain and brain stem structures.

From studies of CES in monkeys, Jarzembki, Sanford, and Sances, Jr. (1970) measured 42 to 46% of the current entering the brain, with the highest concentration in the limbic region. Rat studies by Krupisky (1991) showed as much as a threefold increase in  $\beta$ -endorphin concentration after just one CES treatment. Pozos, Richardson, and Kaplan (1971) conducted mongrel dog research that suggests CES releases dopamine in the basal ganglia, and that the overall physiological effects appear to be anticholinergic and catecholamine-like in action. Richter, Zouhar, Tatsuno, et al. (1972) found the size, location, and distribution of synaptic vesicles were all within normal limits after a series of ten, 1-hour treatments in Rhesus monkeys. Several studies in stump-tailed macaques and humans revealed a temporary reduction in gastric hypersecretion (Kotter, Henschel, Hogan, et al., 1975; Reigel, Dallmann, Christman, et al., 1970; Reigel, Larson, Sances, Jr., et al., 1971; Wilson, Reigel, Unger, et al., 1970).

A recent review by Kirsch (1999) of 106 human studies involving 5439 subjects (4058 receiving cranial electrotherapy stimulation, while the remainder served as sham-treated or placebo controls) revealed significant changes associated with anxiolytic relaxation responses, such as lowered reading on electromyograms (Forster, Post, & Benton, 1963; Gibson, & O'Hair, 1987; Heffernan, 1995; Overcash, & Siebenthal, 1989; Voris, 1995), slowing on electroencephalograms (Braverman, Smith, Smayda, & Blum, 1990; Cox, & Heath, 1975; Heffernan, 1996; Heffernan, 1997; Krupitsky, 1991; McKenzie, Rosenthal, & Driessner, 1971; Singh, Chhina, Anand, et al., 1971), increased peripheral temperature, an indicator of vasodilatation (Brotman, 1989; Heffernan, 1995), reductions in gastric acid output (Kotter, Henschel, Hogan, et al., 1975), and in blood pressure, pulse, respiration, and heart rate (Heffernan, 1995; Taylor, 1991).

The efficacy of CES has also been clinically confirmed through the use of 27 different psychometric tests. The significance of CES research for treating anxiety has been reconfirmed through meta-analyses conducted at the University of Tulsa by O'Connor, Bianco, and Nicholson (1991), and by Klawansky, Yeung, Berkey, Shah, et al. (1995) at the Department of Health Policy and Management, Harvard School of Public Health.

Seventeen studies conducted follow-up investigations from 1 week to 2 years after treatment (Brotman, 1989; Brovar, 1984; Cartwright, & Weiss, 1975; Flemenbaum, 1974; Forster, et al., 1963; Hearst, Cloninger, Crews, & Cadoret, 1974; Heffernan, 1995; Hochman, 1988; Kogler, Hicks, & Barger, 1971; Magora, Beller, Assael, & Kenazi, 1967; Matteson, & Ivancevich, 1986;

Moore, Mellor, Standage, & Strong, 1975; Overcash, 1999; Patterson, 1988; Smith, 1999; Turaeva, 1967; Weiss, 1973). Sixteen of 16 (100%) reported that at least some of the subjects had continued improvement after a single CES treatment, or a series of CES treatments. The other follow-up report only commented on safety (Forster, et al., 1963). None of the 17 studies revealed any long-term harmful effects.

When restricted to anxiety populations or studies that measured for physiological and/or psychological changes in anxiety, there are 40 scientific studies of CES involving 1835 patients. Thirty-four of the 40 (85%) studies reported efficacious results in the treatment of anxiety. Five of the studies on CES (all using the Alpha-Stim) support the effectiveness for managing anxiety during or after a single treatment (Gibson, & O'Hair, 1987; Heffernan, 1995; Smith, 1999; Voris, 1995; Winick, 1999).

None of the 6 of 40 (15%) anxiety studies categorized by the authors as having negative or indeterminate results were recent; 5 were done in the 1970s, and one in 1980. Three showed both actual treatment and sham groups to improve significantly, most likely because both groups were also taking medications (Levitt, James, & Flavell, 1975; Passini, Watson, & Herder, 1976; Von Richtofen, & Mellor, 1980). One was a depression study in which the author noted that acute anxiety was not relieved and again, the study did not control for medications (Hearst, et al., 1974). One reported no significant change on anxiety or depression scales, but subjective insomnia improved ( $P < .05$ ) during active treatment (Moore, et al., 1975). Only one study conducted on a population of insomniacs, with an average duration of symptoms for almost 20 years, did not show any significant change at all in any parameters (Frankel, Buchbinder, & Snyder, 1973). [Perhaps the device used in Frankel's study was defective.]

Cranial electrotherapy stimulation has been well researched and clearly proven to be the most effective, and safest method of treatment for anxiety, and anxiety-related disorders. It is also highly effective for depression and insomnia, muscle tension, fibromyalgia, and headaches. As an increasing number of patients seek alternatives to the side effects and potential addiction to mood-altering pharmaceuticals and controlled substances, CES offers a viable solution. It is easy enough to offer CES in a psychologist's, dentist's or physician's office, clinic, or hospital, and chronically stressed patients will find it cost-effective over time to own their own CES device.

## INDICATIONS

In addition to the primary claims for anxiety, depression insomnia, and pain, CES has been researched with significant results for many other conditions. Smith and Shiromoto (1992) showed it to be highly effective in blocking fear perception in phobic patients. Favorable

results also have been reported for labor, epilepsy, hypertension, surgery, spinal cord injuries, chronic pain, arthritis, cerebral atherosclerosis, eczema, dental pain, asthma, ischemic heart disease, stroke, motion sickness, digestive disorders as well as various addictive disorders including cocaine, marijuana, heroin and alcohol abuse (Brovar, 1984; Daulouede, 1980; Feighner, Brown, & Olivier, 1973; Gomez & Mikhail, 1978; Overcash & Siebenthall, 1989; Patterson, 1983; Schmitt, Capo, Frazier, & Boren, 1984; Smith, 1975; Smith, 1982; Wharton, McCoy, & Cofer, 1982).

Reflex sympathetic dystrophy (RSD) and fibromyalgia syndrome (FS) are two significant pain diagnoses from primary central and autonomic nervous system etiologies that respond best to CES (Alpher & Kirsch, 1998; Lichtbroun, Racier, & Smith, 1999). Adding somatic treatment with MET to these two conditions does not seem to improve the outcomes.

Besides specific pathological disorders, there are a growing number of studies being conducted that show increases in cognitive functions. Michael Hutchison (1986) discussed several mind-enhancement techniques in his book *Megabrain*, devoting Chapter 9 to CES as a tool for attaining higher levels of consciousness. Sparked by Hutchison, Madden and Kirsch (1987) completed a study that demonstrated CES is a useful tool for improving psychomotor abilities. Smith (1999) demonstrated that CES significantly improved stress-related cognitive dysfunction, such as attention deficit disorder (ADD), after only 3 weeks of treatment, and maintained the effect through an 18-month follow-up assessment.

## METHODOLOGY

Cranial electrotherapy stimulation devices are generally similar in size and appearance to TENS units, but produce very different waveforms. *Standard mA-current TENS devices must never be applied transcranially.* CES electrodes can be placed bitemporally, forehead to posterior neck, bilaterally in the hollow just anterior to the mastoid processes, or through electrodes clipped to the earlobes. The ear clip method, developed by the author, is the easiest and possibly most effective electrode placement.

The electrodes must first be wet with an appropriate conducting solution. When using ear clip electrodes, apply them to the superior aspect of the ear lobes, as close to the jaw as possible. Start with a low current and gradually increase it. If the current is too high the patient may experience a painful stinging sensation at the electrodes, dizziness, or nausea. If any of these three symptoms arise, *immediately* reduce the current and the symptoms will subside in a few moments. After a minute or two, try increasing the current again, but keep it at a comfortable level. It is okay for the patient to feel the current as long as it is not uncomfortable.

The ideal treatment time is 20 to 60 minutes, but some patients may achieve the full benefits of a CES treatment within 10 minutes. Many dentists use it instead of nitrous oxide gas to help relax patients during dental procedures (Winick, 1999). Sometimes these dental procedures last for hours with the patient undergoing CES treatment the entire time.

Although CES treatment is indicated for insomnia, because of the increased alertness some patients find it difficult to fall asleep immediately after a treatment. Accordingly, it is recommended that CES be used at least 3 hours before going to bed. Also, in most cases after daily treatments for the first week or two, treating every other day is usually more effective than daily treatment.

## THE CES EXPERIENCE

During the treatment, most patients will experience a subjective change in body weight. They may feel heavier at first and then lighter, or they may feel lighter initially. The patient may feel worse during the heavy cycle and this feeling can last for hours or even days in rare cases unless extra treatment time is given. Therefore, it is important to continue the treatment if the patient feels heavier at the end of the allotted time, even if it has already been 20 minutes or more. Continue for at least 2 to 5 minutes after the patient feels lighter. Not all patients will be aware of these weight-perception changes.

Following CES, most people feel better, less distressed, and more focused on mental tasks. They generally sleep better and report improved concentration, increased learning abilities, enhanced recall, and a heightened state of well-being.

Psychologists first described these general feelings during the 1970s as an *alpha state* of consciousness. Meditation, biofeedback training, relaxation instructions, chanting, hypnotherapy, and certain religious rituals also produce such states. This is not the same as the alpha brain wave frequency of 8 to 13 Hz. Often, practitioners are confused by device representatives who claim that their particular devices will output and entrain a brain to the alpha *frequency*. There is no evidence to support that CES devices work on an entrainment principle.

## CONTRAINDICATIONS

There have not been any significant lasting harmful side effects reported in any of the research literature from either MET or CES. As with all electrical devices, caution is advised during pregnancy, and with patients using an older model (pre-1998) demand-type pacemaker. In addition, it is recommended that patients do not operate complex machinery or drive automobiles during and shortly after a CES treatment.

## SUMMARY

Microcurrent electrical therapy and cranial electrotherapy stimulation are electromedical modalities that use low level currents that usually do not exceed 1 mA. Beneficial effects have been reported for a wide variety of pain, psychological distress, and addiction-related disorders.

Pain is a complex process encompassing the entire nervous system. To achieve optimal results through electromedical intervention, the peripheral and central nervous systems should both be treated. Cranial electrotherapy stimulation induces a relaxed, alert state. It is a primary modality effective for controlling anxiety, depression, insomnia, and generalized stress ubiquitous in pain patients. In addition, there is mounting evidence that CES can enhance cognitive functions. Because of its safety and effectiveness, the combination of MET and CES used with the protocols described here is highly recommended for a broad range of pain and stress-related disorders.

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