

Improving Patient Outcome in Difficult Cases Using Cranial Electrotherapy Stimulation (CES)

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Cranial Electrotherapy Stimulation (CES) is a prescription medical device that when applied can benefit many patients experiencing emotional upsets and an unbalanced Autonomic Nervous System, imparting positive physiological and behavioral changes.^(1,2) The noninvasive application of low levels of microcurrent (less than 1 to 3 microampere in animals) is easily applied via ear clips.

CES was named in 1978 by the FDA's Neurology Panel after new laws required the assessment of the safety and effectiveness of prescription only devices then on the market.^(3,4) It is now FDA authorized for anxiety, depression and insomnia. Also it is used (with or without medication) for fibromyalgia, ADD/ADHD, PTSD, CRPS (RSD), phantom limb pain, and other pain syndromes.

Electromedicine in the form of CES imparts an electrical signal with a frequency that perfectly matches the receptors in the body to resonate and activate intracellular responses, even from long distances (like tuning in a radio). It can produce within the body an electrical activity pattern known as an alpha state, as measured by EEGs.⁽⁵⁾ QEEG changes were reported in 30 subjects treated with 20 minutes of Alpha-Stim CES. There was an increase in alpha activity with a simultaneous decrease in delta activity. (Courtesy of Richard Kennerly, University of North Texas Ph.D. dissertation.)

The resultant central and peripheral effects of feelings of calmness, relaxation, increased mental focus, decreased stress-effects, reduced agitation, stabilized moods and the ability to control both sensations and perceptions of particular types of pain, makes cranial electrotherapy stimulation a welcome modality in treating patients with behavior disorders.⁽⁶⁾

CES can change the electrical and chemical activity of certain nerve cells in the brainstem thereby amplifying activity in some neurological systems, and diminishing the activity of others, such as in the hypothalamus. This form of CES engages distinct populations of "on" and "off" modulatory cells of the serotonergic (5-HT) raphe nuclei of the brainstem reticular formation. 5-HT inhibits brainstem cholinergic and noradrenergic systems that project supratentorially. This suppresses thalamo-cortical activity, arousal, and agitation, alters sensory

processing and induces an EEG alpha rhythm. As well, 5-HT can act directly to modulate pain sensation in the dorsal horn of the spinal cord, and alter pain perception, and cognition and emotionality within the limbic forebrain.⁽⁷⁾

CES research by neurosurgeon C. Norman Shealy, MD found Beta-endorphins to be 98% higher in plasma and a 219% increase in cerebrospinal fluid (CSF). Serotonin was 15 – 40% greater in the plasma and elevated by 50 – 200% in the CSF.

As of 2002, 29 experimental animal studies have been documented. A study performed on primates where receptor electrodes were placed across varying sites in the brain, showed that CES current across the head sent electrical impulses through every area of the brain focusing heavily in the limbic system.⁽⁶⁾ “That means that CES stimulates the brain’s pain neuromatrix directly and it also stimulates the limbic, or emotion center of the brain, either one or both of which could be important in altering or raising the threshold of the pain message.”⁽⁸⁾

An experimental rat study with CES documented as much as a 3-fold increase in B-endorphin after just one CES treatment. (Krupisky, 1991) Stinus, 1990, Tail Flick Latency studies in rats revealed a significant increase in the analgesic effect of opiates when combined with CES. Further testing suggested that CES potentiation of opiate-induced analgesia is centrally mediated.

A double-blind study done by Clark, Mills, and Marchant in England in 2000 evaluated the potential efficacy of Alpha-Stim® CES in horses for stress reduction. Thirty three behavioral traits including body locomotion, head motion, ear position, oral behavior, and lower lip response were monitored. All of the changes were highly intercorrelated and strongly indicated a reduction in the horses’ state of arousal following CES treatment that was not noted in the sham treatments.⁽⁹⁾

Pozos, et.al.1971 at University of Tennessee Medical Center studied the cholinergic/adrenergic system in several experiments with dogs. Reserpine, a dopamine reuptake blocker, was injected followed by application of electrical current to engender increased dopamine release into the synapse. It would consequently be broken down by monoamine oxidase (MAO) giving the dogs Parkinson-like symptoms. Then, while the reserpine was still blocking the dopamine reuptake, atropine was injected to act as a blocker to the postsynaptic uptake of acetylcholine, thereby preventing or reducing acetylcholine’s effect on the postsynaptic membrane.

The Parkinson-like symptoms disappeared and the dogs returned to normal behavior. In phase two the researchers removed the atropine and added physostigmine to the still reserpinized dogs. The physostigmine was intended to block the MAO breakdown of intrasynaptic acetylcholine, making more of it available. The dogs responded with their most profound Parkinson-like symptoms. Lastly, they removed all drugs from the dogs’ bloodstream and found

that dogs allowed to go about their normal activities recovered in three to seven days, while a similar group given CES stimulation recovered in two to eight hours!⁽¹⁰⁾

Human studies have further shown EMG responses with a reduction in spasticity in patients with hemiplegia and paraplegia that was maintained for 1 week post treatment. Other patients showed an increase in relaxation and reduction of involuntary movements. Also some of those with Parkinson's and dystonia musculorum symptoms were seen to be changed during treatment and eventually completely eliminated.

Research methodology of 86 pivotal (out of 126) studies of CES included 35 Double-Blind Placebo-Controlled, 9 Single-Blind, 5 Controlled Study, 6 Crossover 22 Open Clinical Trials, 2 Retrospective Study, 3 Case Study and 3 Follow-up. Two Meta-Analyses studies reconfirmed the significance of CES research for treating anxiety. Both found CES significantly effective for anxiety ($P < .05$). CES is three times more efficacious than the average SSRI.

Specific conditions have shown positive response following the use of CES. Improvement in RSD (Reflex Sympathetic Dystrophy), Alpher and Kirsch, 1998 and on an assessment of 363 fibromyalgia patients over a 3 week to 2 year period 42% reported 50-74% improvement in symptoms.

Normal thalamic function can be altered by a variety of psychological and physical traumas resulting in deranged firing orders from the thalamus. Deranged firing orders from the thalamus to other areas of the brain can result in depression, anxiety, insomnia, ADD, eating disorder, addictions, and OCD. The conclusion is that most health problems arise from overarousal, underarousal, or instability in the CNS.⁽¹¹⁾ "...The proposed net effect of multiple streams of diverse information reaching into and being sent back to the cerebellum is that the cerebellum integrates multiple internal representations with external stimuli and self-generated responses. The cerebellar contribution to these different subsystems permits the ultimate production of harmonious sensorimotor, cognitive, and affective autonomic behaviors."⁽¹²⁾

CES is effective in improving thalamic and cerebellar function through a variety of known and potentially other yet unknown mechanisms. Since only 2% of neuronal communication occurs at the synapse there are many medications that cannot come close to helping the body the way cranial electrotherapy stimulation can. CES has the capacity to improve patient outcome for chronic degenerative, neurological, pain and stress-related cases and elevate the therapeutic response when combined with acupuncture.

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