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CRANIAL ELECTROTHERAPY STIMULATION

Cranial electrotherapy stimulation (CES) uses microcurrents, very low voltage electrical signals, applied to the head to improve brain function. CES has been used for over 40 years in Europe, the United States, and other countries to treat depression, anxiety, sleep disorders, headaches, pain, and to relieve spasticity in children with cerebral palsy. Two studies found that CES increased attention and concentration in normal adults (Hutchinson, Frith, Shaw, Judson, & Cant, 1991; Southworth, 1999). Clinical reports of benefits in treating ADHD are appearing, but controlled studies are needed to validate these promising findings.

Many cases do better when CES is combined with other treatments as was reported in the case of a nine-year-old boy with anxiety, dyslexia, and ADD (Overcash, 2005). The child was described as nervous, disorganized, and having frequent stomach aches and headaches due to anxiety about going to school. In the third grade, despite tutoring and working with a speech and language pathologist, he could not recognize all the letters of the alphabet and was reading at a Kindergarten level. Changing his Ritalin to Concerta and using Project Read reading program five days a week for three months produced no improvement. At that point the parents agreed to Dr. Overcash's recommendations to discontinue medication and begin Alpha-Stim CES for one hour every morning and evening to reduce anxiety and ADD symptoms. In addition he prescribed neurotherapy using the ROSHI/BrainLink one hour twice a week during his sessions with the reading specialist to improve his concentration and ability to learn. The parents and teachers began to report that the boy was more "settled" and easier to work with after CES treatments. He was also better able to concentrate and learn. By the end of 6 months treatment, his overall IQ increased from 97 to 112 with substantial improvements in concentration and memory. Reading improved to a third grade level, spelling to a fourth grade level, and math to a fourth

grade level. The stomachaches and headaches stopped as he became less anxious. Follow-up two years after discontinuing neurotherapy showed that the benefits were maintained.

In clinical practice, we find that CES is often helpful for people with ADHD because it can improve attention, reduce anxiety, and relieve insomnia. Sometimes we get unexpected benefits, even in extremely difficult situations such as this—The Grinch that Stole Childhood.

For most children, each day is a new adventure. Children look forward to playing with their friends, learning new things, experiencing loving relationships, and enjoying feelings of pride as they master new skills. Severe ADHD can rob a youngster of the normal joys of childhood.

Daniel had had enormous problems all his life. In addition to ADHD, he suffered from depression, anxiety, insomnia, and multiple learning disabilities. Being impulsive, hyperactive, and inattentive, he repeatedly broke school rules, defied his father and school authorities, and cursed like a sailor. When his parents argued, he became agitated and had panic attacks. By the age of 11, he had developed an Internet pornography addiction. Other children could not stand to be around him, leaving him with no friends. He often thought, "Life is not worth living. I wish I wasn't alive."

Daniel was one of those children with ADHD who do not respond to stimulant medications. Trials of Ritalin, Adderall, Strattera, Atomoxetine, Trileptal (oxcarbazepine), serotonin reuptake inhibitors, and other antidepressants all failed. Treatment with two mood stabilizers (anticonvulsants), Depakote (divalproex) and Gabapentin (neurontin), yielded only slight improvement. Clonazepam and melatonin helped a little with sleep. Nothing worked well. His EEG during sleep revealed a severe parasomnia (an abnormal pattern of arousal) for which there is no known treatment.

Daniel started using marijuana and Ecstasy at age 13 and was hospitalized for a year in substance abuse treatment programs. He continued to abuse marijuana and was rehospitalized for 6 months. By this time he was being treated with multiple medications: Adderall, Seroquel (quetiapine), Zoloft (sertraline), Gabapentin, Remeron (mirtazapine), trazadone, and Zyprexa (olanzapine) with minimal improvements.

The family brought him to see me (Dr. Brown) for a consultation. I advised them to try a CES device (Fisher Wallace). The father's first reaction was, "How could that possibly help my son? You're supposed to be a doctor!" I finally convinced the boy and his parents to give this approach a try.

The CES began to work within the first month. Using level 2 (this device has four levels of intensity) for 20 minutes twice a day, Daniel was sleeping better, felt less anxiety, and noticed improvements in mental focus and energy. He admitted, "It's a real relief." Teachers began to compliment his work. The craving to abuse substances faded and he stopped using marijuana and quarts of caffeinated drinks. The dose of Adderall was reduced from 80 to 20 mg a day. He stopped seeking out Internet porn sites and became interested in more age-appropriate activities. For the first time in his life, he had friends who enjoyed hiking, canoeing, and camping with him.

Daniel told me, "I used to feel horrible waking up every morning. Now I wake up and look forward to the day. The CES helps with my organization, and I'm more independent. I don't think about death anymore. I'm thinking of getting a job."

Many people who feel better using a CES device begin to slack off, and Daniel was no exception. He came in 9 months later, sounding like he was getting worse again. He admitted that he was using the CES only once a day a few days during the week. I asked him, "Do you remember how awful it used to be? Do you want to go back to that?" Of course, he didn't. By increasing his use of the CES to once a day, *every day*, Daniel was able to remain well. When Daniel is inconsistent with CES treatment, his symptoms tend to worsen, but he has never slipped back to the state of severe dysfunction he suffered before treatment.

How Does Cranial Electrotherapy Stimulation (CES) Work?

Unlike electroconvulsive therapy (ECT), which uses high-amplitude currents, CES uses very small currents (less than in a cell phone) that do not cause seizures or convulsions. The currents are so low that usually the patient does not even feel them.

Studies show that 20 minutes of CES treatment increases the levels of

neurotransmitters: serotonin, norepinephrine, beta-endorphins, GABA, and dehydroepiandrosterone (DHEA; Liss, & Liss, 1996). Norepinephrine is known to improve mental alertness, and serotonin is involved in the modulation of dopamine, learning, mood, and memory. In Daniel's case, there were clear improvements in alertness, learning, and mood. Although beta-endorphins are best known for their role in pleasure pathways, they are also involved in learning, memory formation, and the sense of reward (Routtenberg, 1978). In Chapters 1 and 2 we discussed reward deficiency syndrome, the inability to enjoy the usual sources of pleasure in life. Although it cannot be proven, it is certainly possible that the endorphin effects of CES contributed to changes in Daniel's ability to enjoy normal activities with his peers rather than having to seek excessively stimulating experiences. He acquired the ability to feel rewarded through recreational activities as well as from school achievements. The ability to experience pleasure and reward enabled him to wake up and look forward to each day. Increases in GABA are important because it is the primary inhibitory neurotransmitter in the brain. As such, it is essential for moderating and controlling over-reactivity. Such improvements in self-regulation may have helped Daniel to reduce his anger and control his destructive behaviors.

An additional mechanism that may contribute to the beneficial effects of CES is the stimulation of sensory nerves that could activate the parasympathetic system (calming). In Chapter 5 we discussed the importance of activating the parasympathetic system to balance the stress response system in ADHD. When these systems are well balanced, the result is calmness better problem solving, and improved emotion regulation, impulse control, and behavior. Furthermore, the CES also turns on the reticular activating formation, the network responsible for maintaining arousal, alertness, and attention.

We know that CES treatments can increase levels of neurotransmitters that are crucial for arousal, attention, learning, and memory. What we still don't know is exactly how the microcurrents bring about these changes in the neurotransmitters. Theories have been advanced, but so far, none has been proven (Klawansky et al., 1995). We do know that CES research is gearing up in major medical cen-

ters. This research should provide evidence that will confirm previous reports and our own positive clinical experience.

Are There Different Kinds of CES Devices?

There are eight FDA approved CES devices currently on the market. The most extensively studied are ALPHA-STIM® and the LISS Cranial Stimulator device (now marketed by Fisher Wallace). Most CES machines consist of a small handheld unit containing AA or 9-volt batteries. Current from the batteries travels through two wires to two electrodes that are attached to the head or earlobes. Treatments usually last 20 to 40 minutes. Depending on the severity of the condition, the CES can be used once or twice a day at a prescribed level of intensity. Results may be seen in 1 week, but may take as long as 2 months of daily use.

ALPHA-STIM® and the Fisher Wallace Stimulator have FDA approval for the treatment of anxiety, depression, and sleep disorders, and acute and chronic pain. Studies also suggest benefits for ADHD, headache, and obsessive-compulsive disorder. Further research evidence is needed to obtain approval for the specific FDA indication for use in ADHD.

A prescription from a physician is needed to order the CES. The advantages of this device are that it is very safe, even for young children, when used in the correct doses. It can be used to improve response to medications, to reduce the dose of medications, and sometimes to eliminate medications. The CES targets a wide range of symptoms associated with ADHD, including attention, hyperactivity, impulsivity, learning disorders, behavior problems, anxiety, depression, reward deficiency, and sleep. Although it is covered by only a limited number of insurance companies, it may still be worth the investment when one considers the ongoing cost of medications and doctor visits, as well as the toll that ADHD can take on the lives and happiness of the patient and family. Most companies have a money-back policy (minus processing charges) if the device is not effective within 1 to 2 months.

Who Could Benefit from Trying CES?

- Anyone with ADHD could benefit from a trial of Cranial Electrotherapy Stimulation (CES), particularly if there are symptoms of anxiety, panic attacks, phobias, agitation, insomnia, depression, processing problems, or procrastination.
- For those few people who may become overstimulated or agitated in reaction to CES, the duration of each treatment can be shortened, starting with 3 minutes and increasing very gradually, as tolerated.
- We recommend consultation and monitoring by a health care professional who is knowledgeable in the use of CES for adults and children.

CES can be combined with other treatments such as medication, neurotherapy, breathing practices, and remediation of learning disabilities for optimal results.