

ESSENTIAL TREMOR AND TREATMENT WITH PEMF DEVICES

Essential tremor (ET) is a neurological condition that most commonly causes a rhythmic trembling of the hands while performing a task like eating, writing, dressing, drinking, or holding a posture such as holding the arms stretched out in front of the body. The tremor may affect the head, voice, legs, and trunk as well. Some people even feel a shake from within. ET is often mistaken for Parkinson's disease, but it is 8 times more common, affecting an estimated 10 million Americans and millions more worldwide. It was once known as familial tremor, benign tremor, or hereditary tremor. Essential tremor is more than just a tremor. It's a condition that changes lives. Many people with ET never seek medical care because of stereotypes and lack of awareness.

The incidence (the current risk of getting a disease) of ET is approximately 4% of individuals 40 years of age and older and becomes increasingly more common with age. The most common treatment for ET is medication (primidone and propranolol) and surgery (deep brain stimulation, focused ultrasound, and thalamotomy). Although various approaches report a reduction of tremors, drug and surgical approaches are limited by costs and potential side effects. As a result, there is a continuing search for more effective treatment options for tremor reduction in ET patients.

Essential tremor is considered a neurodegenerative disease. Research has shown that there is a progressive worsening in tremor scores over time. There is an average increase in tremor severity from baseline by 3.1% to 5.3%. Stages of severity vary from Glass Scale I to IV. Glass Scale score I is mild severity, when the patient may need occasional medication. Score II is moderate severity, during which people commonly need continuous drug therapy. Scores at stages III and IV have high severity, when the patient often needs multiple therapies and surgery. Of patients with ET for more than 40 years, 20% to 60% have a high severity tremor, with fewer than 10% being incapacitated. Tremor on one side of the body at the first medical visit helps clinicians predict future disease severity. The rate of change in severity is also higher in those with a family history of ET. Age at onset affects the rate of progression. Those with onset after 60 years of age progress more rapidly. In tremor beginning before 40 years of age, the rate of progression is low.

THERAPEUTIC OPTIONS

If the tremors are mild, some simple lifestyle changes may help:

- *Follow an appropriate sleep schedule.* For some people, physical exhaustion can cause tremors.
- *Try relaxation techniques.* This can work well for tremors brought on by stress or heightened emotions.
- *Consider occupational therapy.* An occupational therapist can help you adjust to living with the tremors. Some simple changes can make life easier. Use eating utensils with larger handles. Wear wrist weights to stabilize the hand. Select clothes that are easy on and off — no buttons!
- *Avoid aggravating substances.* Medications (like certain antidepressants, antiepileptics, or asthma inhalers) or foods (caffeine, energy drinks) can worsen tremor.

For more bothersome tremors, medications may be tried. A good result with medication would be reduction in tremor by about 50%, which is not consistently seen. Medications are typically only for symptoms and do not stop the progression of the condition.

- *Propranolol, beta blocker*: These meds are commonly used to treat high blood pressure. Don't use beta blockers if you have asthma or a heart problem. Side effects can include fatigue and lightheadedness.
- *Primidone*: This antiseizure drug is typically used to treat epileptic seizures. Side effects can include short-term drowsiness, concentration problems, and nausea.
- *Botox*: This injectable drug is an accepted treatment for such conditions as migraine, bladder dysfunction, and excessive sweating. It is also used to treat hand, head, or voice tremors. When used for hand tremors, you may notice finger or wrist weakness. When used for voice tremors, Botox can cause a raspy voice or swallowing difficulties.
- Various other medications can be tried, including clonazepam, gabapentin, topiramate, and zonisamide although these are generally less effective.

In more severe situations, surgical treatments may be recommended. These are restricted to very bothersome or disabling tremor that is not adequately managed on medication. A good result with surgery would be elimination or near elimination of tremor. Major complications and side effects are a risk, and treatment results are not predictable. Also, surgical treatments may not delay progression or the development of new tremors.

NONINVASIVE BRAIN STIMULATION (NIBS) TECHNIQUES

Noninvasive brain stimulation (NIBS) techniques have been investigated by ET researchers as alternatives to the conventional ET treatments over the past decade. NIBS involves transcranial magnetic stimulation (TMS) and transcranial direct current stimulation (tDCS). tDCS is very uncomfortable to achieve adequate levels of stimulation.

Researchers have reviewed and comprehensively analyzed multiple studies investigating the effects of 1 pulse per second (PPS) NIBS treatments on reducing tremor in ET patients. They addressed four leading questions:

1. Do NIBS interventions improve tremor as based on clinical tests or objective tremor assessment?
2. Does stimulation of the cerebellum (the base of the brain) or over the motor cortex (the side of the head above the ear) show improvement in tremor?
3. Do single versus multiple treatment sessions influence the results?
4. Is there a reduction in tremor at 1 day before or 1 day after treatment ends?

The results of their research showed that NIBS reduced both symptoms and objective measurements of tremor—54% reduction in clinical symptoms and 62% in objective measures. Treatment over the cerebellum and over the motor cortex were 55% and 75% effective, respectively, but statistically were not significantly different. This means that stimulating either brain location would produce similar benefit.

In many neurological conditions, treatment of the brain is opposite to the side of the predominant symptoms. For example, in stroke, weakness or paralysis in the left side of the body would be the result of damage to the right side of the brain. In the case of ET, symptoms can be one-sided or involve both sides. The location of brain treatment in people with symptoms more on one side of the body or both sides may not make a difference. In other words, treatment of the opposite side of the brain may still produce benefits as same side treatment. This may be because stimulation effects reverberate throughout the brain.

As for the number of treatment sessions needed, treatment for only one session or multiple sessions both have benefit—53% versus 69% improvement. Other studies with neurological disease have suggested that repetitive stimulation over time is more likely to induce better improvements in brain activity and cognitive and motor functions than a single session of stimulation. But, reductions in tremor were not directly related to the number of sessions. So, a threshold number of treatment sessions would produce optimal improvements in tremor over time, and there may be less unpredictability in longer-term benefits with multiple treatments over time. That means that longer term benefits of repeated stimulation are more likely.

HOW PEMF THERAPY (NIBS) CAN HELP ESSENTIAL TREMORS

The benefits of PEMF therapy (NIBS) will also be related to the severity of the condition at the time the treatment is begun and the age of the individual. It is expected that starting earlier in the course of ET is essential to producing the best results. This has been seen in many other conditions for which PEMF therapy has been used.

Since the intensity of the PEMFs used in most essential tremor research was done using very high intensity systems—usually greater than 1.5 Tesla—it is likely that longer term, regular treatment with lower intensity PEMF systems—between 0.5 Tesla and 1 Tesla—will be needed to produce similar results. The much higher intensity TMS studies used between 300 and 1200 pulses per treatment session safely. At 2 PPS and using a home-based PEMF device at about half the intensity of a typical professional TMS device, a treatment session of about 10 minutes would be needed to achieve what would be equivalent to TMS at 300 pulses per treatment session. On the other hand, to achieve 1200 pulses per treatment would require a 40-minute session. At a higher intensity—that is, at 1 PPS—using a similar lower intensity-based home system as above would require about 5 minutes of treatment to deliver the dose equivalent of TMS at 300 pulses per session and about 20 minutes to deliver the equivalent of TMS at 1200 pulses per session.

The decision on how long a treatment session should be would have to be a personal decision based on the time available and knowing the intensity of the PEMF system being used. The key difference between most of the cited research and home-based therapy is that home-based therapy can be continued over much longer periods to obtain and maintain more durable and sustainable results.

References

Kang N and Cauraugh JH. Does non-invasive brain stimulation reduce essential tremor? A systematic review and meta-analysis. *PLoS One*. 2017 Sep 28;12(9):e0185462.

Gironell A, Ribosa-Nogué R, Gich I, et al. Severity stages in essential tremor: a long-term retrospective study using the glass scale. *Tremor Other Hyperkinet Mov (N Y)*. 2015 Mar 13;5:299.