



Essential Tremor & FUS | Patient Guide

Overview

Essential tremor, and other tremor-focused movement disorders such as tremor-dominant Parkinson's disease, can be debilitating. Their hallmark symptoms, shakiness affecting the arms and hands, can dramatically disrupt patients' quality of life. The University of Maryland Medical Center (UMMC) is here to help.

The team of movement disorders specialists at UMMC was among the first in the United States to offer MRI-guided focused ultrasound (FUS) to patients. FUS is a game-changing, noninvasive treatment for essential tremor and other movement disorders. UMMC is leading the way with research into FUS, one of only a handful of institutions nationwide with deep expertise in the procedure.

To schedule a consultation with one of our movement disorders specialists, please call **410-328-3514**.

WHAT IS ESSENTIAL TREMOR?

Essential tremor is the most common movement disorder, affecting about 10 million Americans.¹ It is a neurological (nervous system) condition that causes involuntary and rhythmic shaking. Although it is not dangerous, essential tremor does tend to get worse over time and can make it difficult to complete everyday tasks, from sending a text message to drinking from a cup. Essential tremor is sometimes misdiagnosed as Parkinson's disease.

In about 50 percent of cases, a genetic mutation causes essential tremor symptoms. This mutation can be passed down within families. Researchers are not sure what causes the other half of the cases. However, the risk of developing essential tremor does increase as people get older.

SYMPTOMS OF ESSENTIAL TREMOR

Symptoms of essential tremor include involuntary and uncontrollable shaking, particularly in the hands and arms. The head and voice can also be affected. These tremors tend to get worse with activity and get better at rest.

Essential tremor can be misdiagnosed as Parkinson's disease. While similar, there are some key differences:

- Essential tremor is seen during action and while maintaining a position. With Parkinson's disease tremor appears at rest.
- Essential tremor has a faster, more confined motion, while Parkinson's shakes are slower and longer.



The University of Maryland Medical Center is one of only a handful of hospitals in the country that offers FUS for essential tremor.

DIAGNOSING ESSENTIAL TREMOR

There is no definitive test for essential tremor. Doctors use a combination of techniques to arrive at a diagnosis:

- A detailed medical history, including a family history
- A neurological examination, including tests of coordination, balance, strength, reflexes, and movement
- A physical examination
- Lab tests to rule out other conditions that may be causing the symptoms

When attempting to arrive at a diagnosis, it is important to have an experienced doctor who can identify the small differences between essential tremor and Parkinson's disease.

What is MRI?

MRI stands for magnetic resonance imaging. It is a safe, painless, and noninvasive imaging technology. MRI scans use magnets and radio waves to create images of a section of the body – in this case, the brain. There is no radiation used. MRI scans can see internal organs and tissues in ways that may not be possible with other imaging technologies, such as X-rays or CT scans.



TREATING ESSENTIAL TREMOR

Once your doctor has diagnosed essential tremor or another tremor-focused movement disorder, it is time to put a treatment plan together. The University of Maryland Medical Center offers a variety of treatments for these conditions. Available treatments fall into three main categories:

Treatment option 1: medication

As a first step, many doctors prescribe medications, such as propranolol, to control essential tremor symptoms. However, over time the body develops a tolerance to the drug. This means that the longer you take it, the less effective it is.

Treatment option 2: deep brain stimulation

Deep brain stimulation (DBS) has been the standard of care for more than 15 years. This treatment can produce remarkable results dramatically improving symptoms of essential tremor.

DBS considerations:

- It is invasive: DBS is a surgical procedure during which surgeons drill a hole in the skull and implant electrodes in the brain.
- It uses a pacemaker: To power the electrodes, wires run under the skin from the brain to a pacemaker inserted in the chest.
- It requires future procedures: About every two to five years, it requires additional surgery depending on battery type.

¹National Institute of Neurological Disorders and Stroke, National Institutes of Health. Tremor Fact Sheet. www.ninds.nih.gov/Disorders/Patient-Caregiver-Education/Fact-Sheets/Tremor-Fact-Sheet. Updated March 17, 2020. Accessed September 7, 2020.

Treatment Option 3: FUS

FUS is the newest technology for treating essential tremor and other tremor-focused movement disorders. FUS is currently FDA approved as a safe and effective treatment for essential tremor to treat one side of the brain, with minimal side effects. A trial evaluating treatment on both sides of the brain has been completed and the results are being analyzed.

FUS TREATMENT OVERVIEW

FUS uses high-intensity ultrasound waves guided by high-definition MRI. During the procedure, the patient lays on a table in an MRI machine. There are two stages to the procedure: the planning (mapping) phase and the treatment phase. First, the treatment team uses the MRI to create a map of the brain. MRI enables doctors to pinpoint the area – the ventral indeterminate nucleus – and target it precisely, so that they know exactly where to aim.

What Is the VIM (Ventral Indeterminate Nucleus)?

The VIM (Ventral Intermediate Nucleus) is a small thalamic relay center receiving input from the cerebellum and projecting to the motor cortex. It is a well-established surgical target for stereotactic ablation as well as for DBS (Deep Brain Stimulation) for treatment of essential tremor.

Once the mapping process is complete, the treatment phase begins. The treatment team uses more than 1,000 high-intensity ultrasound waves to remove the brain cells responsible for the tremor while sparing the normal cells nearby. The ultrasound waves travel through the skull to the precise location causing the tremor. FUS does not use radiation and does not require any incisions.

FUS is an outpatient procedure, and patients are awake the whole time. The entire procedure, including the mapping phase and the treatment phase, lasts about three hours. Patients typically notice a major improvement in their essential tremor symptoms right away. This improvement can make a significant difference in patients' quality of life – even for people whose tremor had not improved with medication.

There is a low risk of side effects with FUS, such as changes in sensation in the hand or problems with balance. These side effects are generally minimal, temporary, and not serious.

Patients with essential tremor typically experience a **60 to 70 percent reduction** in tremor symptoms



BENEFITS OF FUS

FUS has several important benefits when compared to other treatments, such as DBS or medication.

1. Patients notice immediate improvement

Patients who have received FUS notice a difference almost as soon as the procedure is complete. Patients typically experience a 60- to 70-percent reduction in symptoms.

2. FUS is clinically proven safe and effective

FUS is an FDA-approved treatment for essential tremor. As clinical trials led by University of Maryland Medical Center and other institutions have shown, FUS works. Patients generally experience a significant reduction in their essential tremor symptoms after FUS, and FUS carries a low risk of side effects.

3. No surgery, no incisions

FUS is a noninvasive procedure done with ultrasound and guided by MRI. That means no cutting is needed, and patients are awake throughout the procedure.

4. Recovery is quick and easy

FUS is an outpatient procedure, with no overnight hospital stay needed. People recover quickly and report getting back to their regular daily activities within a few days.

FUS CLINICAL RESEARCH LEADERS

The University of Maryland Medical Center, along with the University of Maryland School of Medicine, is widely recognized for significant contributions to the field of neuroscience research, including movement disorders research. We are pioneers in the use of FUS to treat essential tremor and tremor-dominant Parkinson's disease.

Beginning in 2015, the University of Maryland Medical Center and the University of Maryland School of Medicine led a pilot study of MRI-guided focused ultrasound for Parkinson's disease.

The University of Maryland Medical Center and the University of Maryland School of Medicine are now

leading a second clinical trial of FUS. We are currently leading a phase 3 study to test the safety and efficacy of using FUS on the brain to treat Parkinson's disease. The pivotal study is the final step before the U.S. Food and Drug Administration (FDA) will consider approving the new technology for widespread use as a nonsurgical treatment option to eliminate key motor symptoms of this common neurological condition.

Our expertise with FUS is one example of how our tradition of clinical research excellence gives our patients fast access to the most innovative treatment options available anywhere.

To speak with our team about how we treat essential tremor with focused ultrasound and through clinical trials, email us at FocusedUltrasound@som.umaryland.edu or call 410-328-0939.

“University of Maryland Medicine is a **world leader in pioneering MRI-guided focused ultrasound** to become a new standard of care for treating many devastating brain diseases including Parkinson's, essential tremor and glioblastoma, an often-deadly type of brain cancer.”

WHY CHOOSE THE UNIVERSITY OF MARYLAND MEDICAL CENTER

The University of Maryland Medical Center is home to the region's most experienced FUS team. It offers:

Faculty-physician experts who are pioneers in FUS technology

To get the best results from FUS, it pays to go to a team with experience using FUS to treat essential tremor. The University of Maryland Medical Center's team directed the groundbreaking clinical trial research that led to FUS being FDA approved for essential tremor.

The most experience with FUS technology

This newly approved treatment is only being offered in a select handful of hospitals nationwide. The University of Maryland Medical Center's team has been using FUS throughout the clinical research process – and continues to use it now that it has

been FDA approved. We enrolled more patients in the clinical trial period than anywhere else in the country and recently completed a feasibility study determining the application of treatment for both sides of the brain. This means we are among the most experienced teams changing the landscape of FUS treatment.

The only FUS center in Maryland

The University of Maryland Medical Center is the only facility in Maryland – and one of the few institutions nationwide – currently offering FUS for essential tremor.

A multidisciplinary team approach to provide the best patient care

An entire team of neurologists, neurosurgeons, diagnostic radiologists, neuroradiologists, and neuropsychologists at the University of Maryland Medical Center all work together to provide the best diagnostic, medical, surgical, and rehabilitative services for patients living with movement disorders, including essential tremor.

Call program coordinator in neurosurgery Shanell Watson at **410-328-3514** or email FocusedUltrasound@som.umaryland.edu to schedule a consultation with one of our movement disorders specialists.



PATIENT EXPERIENCE

Here is an overview of what to expect from the FUS process.

Before the procedure:

1. The first step is to connect with the University of Maryland Medical Center's neurosurgery department. You can contact us directly, or your doctor can give you a referral.
2. Next, one of our team of neurosurgery experts will call you to learn more about your health and find out whether you might be a good candidate for FUS.

- If FUS is a possibility for you, you'll schedule an appointment with one of our movement disorder neurologists, and you'll get a noninvasive CT scan of your brain before the appointment.
- Before you meet with your neurologist, you'll need to have a CT scan of your brain completed. We'll explain how to schedule it. Once the CT is complete, both the neurologist and the neurosurgery department will receive copies of the scan, to coordinate your care.
- Next, it's time to schedule an MRI and consultation with one of our teams of neurosurgeons who specialize in FUS. At this appointment, you'll select a treatment date.

On the day of your procedure:

- After you arrive at the hospital, you'll go to the procedure prep area.
- There, your head will be shaved so that we can place the stereotactic frame.
- Next, we'll escort you to the MRI suite for the procedure, which will take two to four hours.
- Once procedure is finished, you'll spend some time in our observation area before being discharged home. Most patients go home the same day.
- The next day, you will return for a post-treatment MRI scan, and you will have follow-up visits with your movement disorders neurologist at the one-month, three-month, and 12-month marks.

What is a stereotactic frame?

The stereotactic frame is a halo shaped device that is fixed to the head using local anesthesia. It is meant to hold the head securely to the sonocating apparatus thereby preventing any movement of the target during the procedure and ensuring necessary precision.

MEET OUR TEAM

The University of Maryland Medical Center's Movement Disorders Program's multidisciplinary team of physicians and surgeons hold faculty positions at the University of Maryland School of Medicine.

Neurosurgery

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