

## **Surgical Treatments For Essential Tremor: Essential Facts For Patients**

### **What Is Essential Tremor (ET) And What Are Its Treatments?**

ET is the most common movement disorder. Patients with ET experience shaking (tremor) in the hands and, less commonly, head, voice, or other body parts. The tremor with ET is usually worse when holding hands outstretched or making fine hand movements. Though there is no cure for ET, some medications can lessen the tremor. These include:

- Beta-blockers such as propranolol
- Anti-seizure medications such as primidone, gabapentin, and topiramate
- Benzodiazepines such as clonazepam and alprazolam

Some patients may benefit from botulinum toxin injections into the muscles that are involved in the tremor.

### **What Is The Role of Surgery In ET?**

Not all patients with ET benefit from medical treatment. For patients with severe tremor whose tremor shows little response to medications, surgical treatment may be an option. Most surgeries target a part of the brain called the thalamus. Types of surgery include:

- Deep Brain Stimulation (DBS)
- Thalamotomy
- Focused Ultrasound (FUS)
- Gamma-knife surgery (GKS)

#### **DBS: What Is It?**

DBS is a type of brain surgery where a thin, insulated wire called an electrode is placed deep in the brain. For ET, the electrode is usually placed into the thalamus and connected to a pacemaker-like device that is placed under the skin in the chest. The device sends electrical signals to the thalamus. The signals improve the tremor by reducing the abnormal brain activity in that area. The advantage of this therapy is that it does not cause permanent brain damage except for the tiny region where the electrode is placed. Instead, electrical impulses modify brain activity. DBS can be used to treat both sides of the body.

#### **Thalamotomy: What Is It?**

Thalamotomy is a type of surgery where a thin wire is temporarily placed into the thalamus. The tip of the wire is heated to burn a small piece of tissue in the thalamus. The wire is removed at the end of the procedure. This reduces abnormal brain activity and calms tremor. Unlike DBS, thalamotomy is only used to treat one side of the body.

#### **FUS: What Is It?**

Similar to thalamotomy, FUS burns a small piece of tissue in the thalamus which reduces the tremor. However, FUS does not require a hole be made in the skull. Instead, it uses focused ultrasound waves to burn a small piece of tissue in the thalamus. The effect is similar to a thalamotomy.

### **GKS: What Is It?**

GKS is another procedure that uses radiation beams to burn a small piece of tissue in the thalamus, similar to a thalamotomy. No hole is made in the skull. The radiation takes several weeks to months to take effect.

### **How Are These Procedures Done?**

All of these procedures require very precise aim at a small target. Therefore, a special type of head frame is used for brain image scans. This allows the doctor to carefully guide the electrode, ultrasound, or gamma waves to the correct place in the thalamus. The patient typically is awake during these procedures and participates in testing. This ensures that the tremor is being reduced without causing significant side effects.

### **What Are The Main Limitations And Complications Of These Treatments?**

These treatments do not cure ET and tremor may return. Like any treatment, there are risks. The common risks are:

- Reduced balance or coordination
- Speech difficulty
- Numbness or tingling in the arms or hands that may appear after the interventions

These risks are generally reversible by changing the settings of the DBS device, but might persist with other treatments. In rare cases, the surgery for DBS and thalamotomy can cause a stroke, or bleeding in the brain, and/or infection. After treatment with FUS or GKS, inflammation might develop around the treated area.

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