

Patient information: MR guided Focused Ultrasound Thalamotomy for Essential Tremor (MRgFUS)

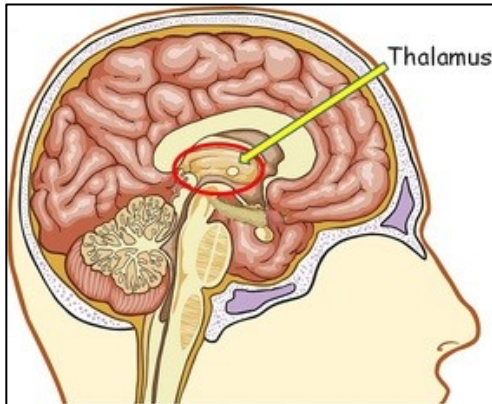
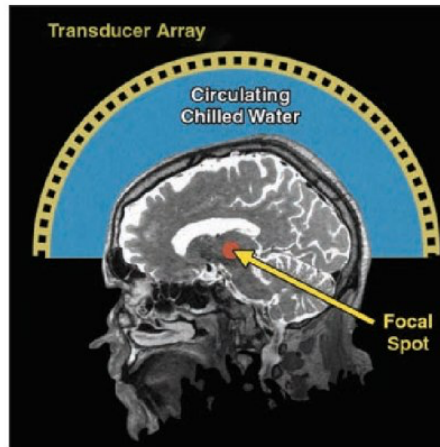
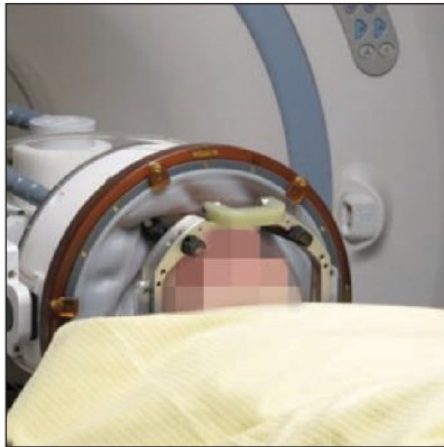


Figure 1. Thalamus location

Where is the thalamus and what does it do?

The thalamus is a small structure deep in the center of the brain (Figure 1). This area relays signals that control sensation and movement between the brain and the body. Sometimes, in the case of essential tremor, these messages become abnormal.

What is a Thalamotomy with focused ultrasound?



A Thalamotomy using focused ultrasound is performed within an MR imaging machine and an additional helmet. The ultrasound helmet is a device that sends out sonic waves from over 1000 different points, all of which are focused on a single target, much like

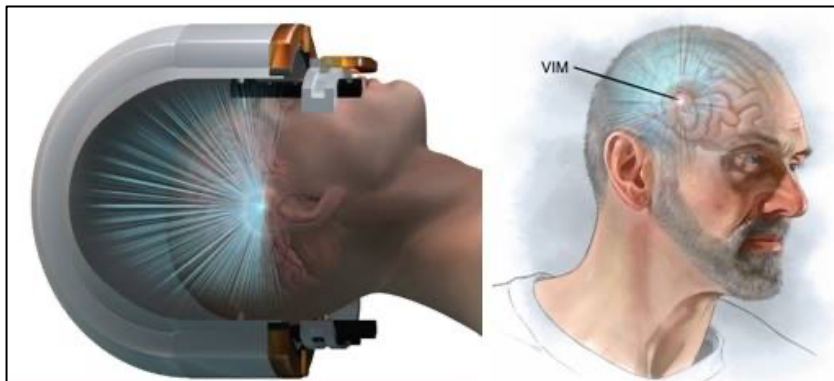
how a magnifying glass can focus light on a single spot. Like the magnifying glass, the focal target of ultrasound becomes heated, without hurting tissue outside of the target.

The intent of this surgery is to create heat and make a small hole in the thalamus area that is known to interrupt the neuronal signals associated with Essential Tremor.

What this means as a patient?

Your head will need to be completely shaved. After applying local anesthesia (like at the dentist's office), we apply a stereotactic frame to your head. A rubber bladder is placed upon your head to create a water-tight seal with the ultrasound machine in order to help keep your skin and skull cool during the ultrasound "sonications".

What is a Sonication?



A "sonication" is one short burst of ultrasound energy. Over the course of your surgery, there will be several sonications. At first, there will be several low strength sonications that allow the surgeon to calibrate their equipment. After each sonication, there will be a

break that allows cooling and the surgical team to evaluate the target and your comfort. Once the surgical team is confident of the target location, several higher ultrasound energy sonications will be used to increase the temperature to approximately 55 – 60 degrees Celsius in order to eliminate a small portion of the Thalamus.

This treatment is not reversible. It can only be done on one side. The benefit is only seen in the hand/arm opposite of the side of the brain we are treating. It does not cure the underlying condition, however, the benefits may last many years. It is important to note that in a small percentage of patients the tremor can reappear over time.

What are the risks and side effects of focused ultrasound for essential tremor?

- Surgical Risks:
 - Bleeding on the brain leading to stroke (<1%)
 - Infection at pin site (treated with antibiotic pills)
 - Nausea - vomiting
 - DVT (Deep Vein Thrombosis, requires 3-6 months of blood thinners)

- Possible side effects:
 - **Early after the surgery:**
 - Problems walking (36% of patients notice this)
 - Tingling, feeling pins-and-needles, or numbness (38% of patients)
 - Incoordination of arms or legs or both (20% of patients)
 - Feeling unsteady (16% of patients)
 - **At one year after surgery some patients still report these side effects:**
 - Problems walking (9% of patients)
 - Numbness/tingling (14% of patients)
 - Incoordination (4% of patients)
 - Feeling unsteady (5% of patients)

As with any surgical procedure, there is risk involved and we cannot predict who will have side effects and who won't, or how severe these side effects could be. With this specific procedure, side effects usually get worse in the first 2 weeks post procedure due to swelling around the lesion created by the focused ultrasound. Symptoms from side effects usually improve at a more rapid pace in the first 3-6 months post-surgery. Improvements can continue to be seen up to 12 months post-surgery with little to no improvement in these adverse effects after one year.

*****It is important to consider the risks involved with focused ultrasound, and how your quality of life may be affected. You will need to ask yourself if side effects happen, is this something you could live with. *****

What appointments are necessary before surgery?

- **Screening:**
 - Clinic visit with movement disorders neurologist, Dr Martino
 - Clinic visit with neurosurgeon, Dr Kiss/Dr Girgis
 - Nursing assessment
 - Videotaping of tremor severity and other relevant movement disorders, cognitive examination, and quality of life scales
 - Neuropsychological testing
 - 3T MRI
 - CT scan for skull bone density
 - KINARM Robotic assessment (research project)
- **Post-operative assessment at 3 months**
 - Clinic visit with movement disorders neurologist

- Clinic visit with neurosurgeon
- Nursing assessment
- 3T MRI
- KINARM

- **Post-operative assessment at 12 months**
 - Neuropsychological testing
 - Clinic visit with movement disorders neurologist
 - Clinic visit with neurosurgeon
 - Nursing assessment
 - 3T MRI
 - KINARM

Who decides if I can go for surgery?

The decision to proceed with surgery is a collaborative discussion by the medical team (Dr. Kiss/Dr. Girgis (Neurosurgeons), Dr. Martino (Neurologist), Dr. Haffendan (Neuropsychologist), Marisol Ardila (Registered Nurse), and Paul Romo (MR Technician). The team will review all of the assessments, and make a decision based on all the information brought forward.

If I am approved for surgery, how long until I can have surgery?

The wait post assessment can be anywhere from 2 months to 6 months depending on the current wait time.