

## Focused ultrasound thalamotomy for treatment of essential tremor and tremor-dominant Parkinson's

Low risk, high results incisionless brain surgery



OHSU is the only hospital in Oregon performing incisionless neurosurgery using MR-guided high-intensity focused ultrasound for the treatment of medication-refractory essential tremor and tremor-dominant Parkinson's disease. Without incisions, the procedure carries low risk. Patients get immediate tremor relief for improved quality of life.

The technology combines image-guided, focused ultrasound ablation with real-time monitoring of temperature change in the brain during the sonication. The procedure takes about three hours and has submillimeter accuracy.

Focused ultrasound is an excellent solution for patients who have dominant unilateral tremor. It is also a good option for patients who aren't candidates for deep brain stimulation (DBS) or who are averse to DBS. For most tremor patients, focused ultrasound does not require an overnight hospital stay.



Incisionless neurosurgery represents the next era in sophisticated procedures that reduce the physical burden on the patient.

### Make a Referral

#### Physician Advice & Referral Service

Fax patient referrals to 503-346-6854.

For physician advice, call 800-245-6478.

Find forms and additional information at

[www.ohsu.edu/provider](http://www.ohsu.edu/provider).

OHSU Connect gives you real-time access to your patient's shared electronic medical record. You will be a partner in care, with information at every step.

[www.ohsu.edu/focusedultrasound](http://www.ohsu.edu/focusedultrasound)





Using focused ultrasound, our team performs extremely precise unilateral thalamotomies without burr holes, craniotomies or ionizing radiation.

**Focused ultrasound procedure**

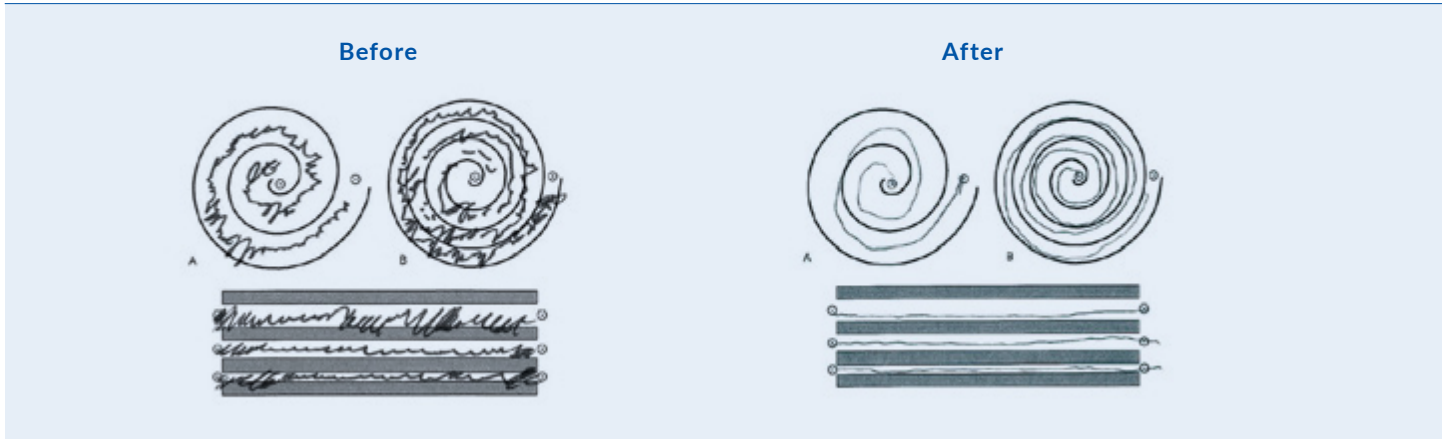
During the procedure, the patient wears a helmet that is fixed to the stereotactic frame. Through the helmet, cold water circulates around the scalp. To keep the patient motionless, pins secure the helmet. Our team provides a local anesthetic to the patient for the placement of the pins. Patients are awake and responsive during the procedure.

The surgeon uses low energy sonication to pinpoint the target, typically the ventral intermediate nucleus. This is a gradual, stop-start process that requires feedback and testing with the patient (i.e., drawing spirals or raising arms) to assess tremor improvement throughout the treatment. The surgeon also receives real-time feedback about temperature changes in the brain.

To ablate the target, the technology emits beams of ultrasonic sound that pass through the scalp and skull, converging to create a tiny, discrete lesion. Patients see the improvement in tremor immediately.

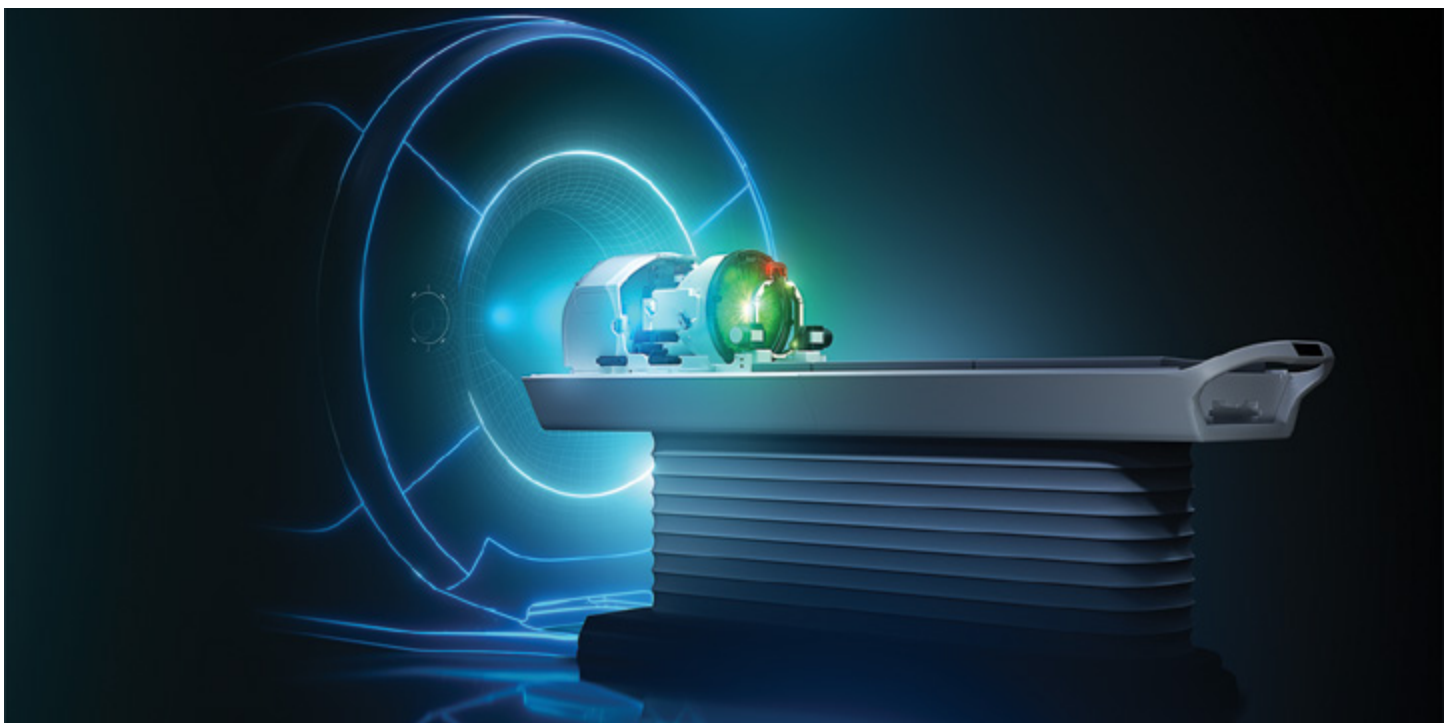
**Why refer patients?**

- Tremor improvement immediately post-procedure.
- No craniotomy with low to no risk of infection or bleeding.
- No implanted hardware or multiple follow-up visits.
- Minimal hospitalization.
- Majority of adverse events are minor or moderate, and transient.



Sample of improvement. Results may vary.

Focused ultrasound expectations	
Results	Immediate tremor improvement. In a clinical study, patients maintain 76.5% improvement after three years.
Outpatient procedure	One procedure that lasts about two to three hours. For accuracy, the procedure requires that the patient's whole head be shaved. Patient remains awake to provide feedback; no general anesthesia.
Recovery	Same-day discharge or overnight stay. Most patients return to normal activity within a week.
Tremor medication	Medication is weaned following surgery.
Side effects	Possible side effects include temporary skin irritation, nausea and vomiting, weakness or imbalance.
Follow-up visits	One post-op appointment.
Recurrence	Tremor may recur in 15-20% patients, but the procedure can be repeated. A patient can also have DBS later if needed.
Medicare coverage	Yes
Commercial insurance coverage	Limited, but growing
FDA approval	The Food and Drug Administration approved focused ultrasound for essential tremor in 2016, and tremor-dominant Parkinson's disease in 2018.



## Patient selection

- Confirmed diagnosis of medication-refractory essential tremor or tremor-dominant Parkinson's disease
- Unilateral tremor
- Age 22+ for essential tremor
- Age 30+ for tremor-dominant Parkinson's
- Able to meet standard MRI protocols
- Able to tolerate prolonged stationary position
- Able to be off anticoagulation medications temporarily
- Skull density ratio above 0.45 ( $\pm 0.05$ )

For patients with bilateral or central tremor, asleep deep brain stimulation (DBS) may be an alternative. OHSU has been at the forefront of DBS for decades and pioneered asleep DBS. Learn more about asleep DBS at OHSU [www.ohsu.edu/dbs](http://www.ohsu.edu/dbs).

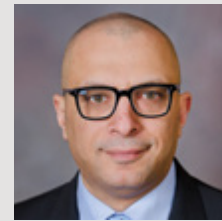
### OHSU Brain Institute provides nationally recognized comprehensive, multidisciplinary care:

- *U.S. News and World Report's* No. 1 ranked hospital in Oregon and ranked among the best nationwide for neurology/neurosurgery programs.
- Certified as a Parkinson's Foundation National Center of Excellence.
- First and only hospital in Oregon to offer MR-HIFU for tremor.
- First hospital in the nation to develop and perform both awake and asleep DBS for treatment of movement disorders.



## About the clinical director

Dr. Ahmed Raslan leads the focused ultrasound for tremor team at OHSU. As a neurosurgeon, he manages patients with a spectrum of neurological disorders. His specialty focus is brain mapping and surgery for movement disorders, epilepsy, cancer and chronic pain. He has several research areas, including outcomes of functional neurosurgery, functional localization using intraoperative and extraoperative mapping.



### Ahmed Raslan, M.D., FAANS

Associate Professor of  
Neurological Surgery

Clinical Director of Focused  
Ultrasound Program

Director of Epilepsy and  
Brain Mapping