Thalamotomy

- New technique for direct targeting of the ventral intermediate nucleus using magnetic resonance-guided focused ultrasound
- MRI-guided Focused Ultrasound VIM Thalamotomy with Indwelling GPi DBS Electrodes: A Case Report
- Successful Unilateral Ventro-Oral (Vo) Thalamotomy for Peripheral Post-traumatic Dystonia With Complex Regional Pain Syndrome: A Case Report
- Enhancing precision in MRgFUS for tremor treatment: a systematic review of tractography-based VIM targeting approaches
- Focused Ultrasound Thalamotomy for Essential Tremor in Patients on Anticoagulation: Case Report in a Patient with Factor V Leiden Mutation and Review of the Literature
- Radiosurgery to the Medial Thalamus for Chronic Pain: A Single Group Experience and Review of Literature
- A retraced spiral strategy with semi-automatic deblurring for volumetric thermometry
- Post-thalamotomy Changes Mimicking Cavernous Malformations on MRI: A Case Report of a Historical Surgical Treatment

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Feature	Thalamotomy	Subthalamotomy
Target structure	Thalamus (mainly VIM nucleus)	Subthalamic nucleus (STN)
Main use	Tremor control	Tremor, bradykinesia, rigidity control
Common in	Tremor-dominant Parkinson's, essential tremor	Parkinson's disease (all motor symptoms)
Typical side effects	Sensory deficits, dysarthria	Hemiballismus (involuntary flinging movements), speech or mood changes
Anatomical position	Above the subthalamus	Below the thalamus

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see Medial thalamotomy

Medial thalamotomy and thalamotomy are related but not the same.

Here's the key difference:

"Thalamotomy" is a general term. It simply means making a lesion in the thalamus to treat a neurological disorder (like tremor, pain, dystonia, etc.). The thalamus is large and has many different nuclei, so thalamotomy could target different parts depending on the disease and symptoms.

"Medial thalamotomy" is a specific type of thalamotomy. It refers to lesioning more medial nuclei of the thalamus, often targeting areas involved in chronic pain (like the centromedian-parafascicular complex, intralaminar nuclei, etc.). It's less common for treating Parkinsonian tremor, where usually a ventrolateral thalamotomy (especially VIM — ventral intermediate nucleus) is preferred.

In short:

Every medial thalamotomy is a thalamotomy,

But not every thalamotomy is a medial thalamotomy.

When treating Tremor-predominant Parkinson's disease, VIM thalamotomy (lateral part) is the standard, not medial thalamotomy.

Modalities

Thalamotomy Modalities

Thalamotomy is a neurosurgical procedure used to treat movement disorders by lesioning a part of the thalamus, usually the **ventral intermediate nucleus (VIM)**. There are several modalities (techniques) for performing a thalamotomy, each with different tools, precision levels, and side-effect profiles.

1. Radiofrequency (RF) Thalamotomy

- **Mechanism**: Insertion of an electrode into the thalamus with thermal lesioning using RF energy.
- **Features**:
  - Requires a stereotactic frame and awake patient.
  - Lesion is created by heating tissue (~70-80°C).
- **Advantages**: Well-established, adjustable in real time.
- **Disadvantages**: Invasive, risk of hemorrhage/infection.

2. Gamma Knife Thalamotomy

- **Mechanism**: Focused gamma radiation to the target area in the thalamus.
- **Features**:
  - Non-invasive.
  - Lesion develops over weeks/months.
- **Advantages**: Outpatient, no incision.
- **Disadvantages**: Delayed clinical effect, no intraoperative monitoring or adjustment.

3. Magnetic Resonance-guided Focused Ultrasound (MRgFUS)

- **Mechanism**: High-intensity focused ultrasound guided by MRI thermometry to ablate target.
- **Features**:
  - Non-invasive, real-time monitoring.
  - Immediate feedback and effect.

- **Advantages**: No ionizing radiation, precise targeting.
- **Disadvantages**: Expensive, skull density limitations, not suitable for all patients.

4. Laser Interstitial Thermal Therapy (LITT)

- **Mechanism**: Laser fiber introduced via a small burr hole; MRI used to monitor thermal ablation.
- **Features**:
  - Minimally invasive.
  - Used in some experimental or off-label settings.
- **Advantages**: Real-time control, smaller entry.
- **Disadvantages**: Still invasive, limited data in thalamotomy.

5. Stereotactic Radiosurgery (e.g. CyberKnife)

- **Mechanism**: Linear accelerator-based radiation targeting (alternative to Gamma Knife).
- **Use**: Occasionally used off-label for thalamotomy in select cases.

Summary Comparison Table

Modality	Invasiveness	Lesion Onset	Real-time Control	Intraop Feedback	FDA-Approved for ET
RF Thalamotomy	Invasive	Immediate	Yes	Yes	Yes
Gamma Knife	Non-invasive	Delayed	No	No	Yes
MRgFUS	Non-invasive	Immediate	Yes	Yes	Yes
LITT	Minimally	Immediate	Yes	Yes	No