Laser Interstitial Thermal Therapy for Drug-Resistant Epilepsy

Clinical Policy ID: CCP.1111

Recent review date: 7/2026

Next review date: 11/2027

Policy contains: Drug-resistant epilepsy; laser interstitial thermal therapy; laser thermal ablation; LITT; magnetic resonance imaging-guided laser thermal ablation.

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Coverage policy

Laser interstitial thermal therapy is clinically proven and, therefore, may be medically necessary for treatment of drug-resistant epileptic seizures, when all of the following criteria are met (Wu, 2021):

- Failure to respond to, or intolerance of, at least two appropriately dosed antiepileptic medications to control disabling seizures
- No contraindications to magnetic resonance imaging
- Documentation of well-defined epileptogenic foci or critical pathways of seizure propagation accessible by laser interstitial thermal therapy

Limitations

Contraindications include (Wu, 2021):

- Inability to identify the epileptogenic focus (or foci) or critical pathways within epileptogenic networks
- Inability to undergo magnetic resonance imaging because of medical reasons
- Medical contraindications to surgery, for example, unstable cardiac or respiratory conditions, anticoagulants that cannot be stopped, or bleeding diatheses

Alternative covered services

Open surgical resection for epileptic seizures

Background

A seizure is a temporary disturbance in brain function caused by excessive or abnormal signals in groups of neurons in the brain. Seizures may produce changes in awareness or sensation, involuntary movements, or other changes in behavior. Usually, a seizure lasts from a few seconds to a few minutes. Epilepsy, sometimes referred to as "*seizure disorder,"* is a general term that refers to a tendency to have recurrent seizures. An estimated three million adults and 456,000 children in the United States have epilepsy. New cases of epilepsy are most common among children and older adults (Centers for Disease Control and Prevention, 2024a).

Causes of epilepsy may be related to hereditary factors, early exposures, and events. Less than half of newly diagnosed cases have no known cause. Known conditions and events that may lead to epilepsy include (Centers for Disease Control and Prevention, 2024a):

- Cysticercosis infection
- Oxygen deprivation (e.g., during childbirth)
- Traumatic brain injury or head injury
- Stroke (resulting from a block or rupture of a blood vessel in the brain)
- Other neurologic diseases (e.g., Alzheimer's disease)
- Brain tumors
- Certain genetic disorders

Epileptic seizures are categorized broadly as generalized or partial seizures. Primary generalized seizures are seizures that begin with widespread involvement of both sides of the brain, whereas partial seizures begin with involvement of a smaller, localized area of the brain. With some partial seizures, the disturbance can still spread within seconds or minutes to involve widespread areas of the brain — causing a secondary generalized seizure (Centers for Disease Control and Prevention, 2024c).

Antiepileptic drug therapy is the treatment of choice for people with epilepsy. For approximately two-thirds of people with a correct diagnosis of epilepsy receiving optimum treatment, antiepileptic drugs are successful in fully controlling seizures. For those with drug-resistant epilepsy, other treatment options include epilepsy surgery, vagus nerve stimulation, and dietary therapies. The goal of surgery is to remove the smallest amount of tissue in order to achieve a seizure-free outcome. Epilepsy surgery is performed most often for seizure foci located in the temporal lobe (Centers for Disease Control and Prevention, 2024b).

Laser interstitial thermal therapy is a minimally invasive, surgical technique that uses magnetic resonance imaging to assess and guide focused laser energy to destroy the desired tissue. Surgeons make a three- to four-millimeter incision in the skull through which an intracranial probe is inserted and guided to the target; thermal ablation can be visualized in real time (Tariq, 2024).

This procedure is also called laser-induced interstitial thermotherapy, laser-induced thermotherapy, interstitial laser therapy, and laser ablation. Theoretically, critical adjacent tissue can be spared and open resection can be performed in the event that ablation is ineffective. Laser interstitial thermal therapy may be an alternative to

surgical resection for the treatment of focal lesional epilepsy in patients who are considered high-risk surgical candidates.

The U.S. Food and Drug Administration cleared the Visualase thermal ablation system (Medtronic Navigation Inc., Louisville, Colorado) in 2006 and the NeuroBlate laser ablation system (Monteris Medical, Inc., Winnipeg, Canada in 2013. Both assist in identifying the target tissue under magnetic resonance imaging guidance while the laser is situated for precise ablation (U.S. Food and Drug Administration, 2006, 2013).

In 2018, the U.S. Food and Drug Administration issued recalls for the NeuroBlate and Visualase systems due to an unanticipated interaction between the thermal therapy system and magnetic resonance imaging causing inaccurate magnetic resonance thermometry during the procedure and potential injury to surrounding tissue. The Administration terminated the recall of Visualase in 2022 and of NeuroBlate in 2021 (U.S. Food and Drug Administration, 2026a, 2026b).

Findings

Magnetic resonance-guided laser interstitial thermal therapy provides a safe and efficacious treatment alternative to surgical resection for drug-resistant epilepsy. Laser interstitial thermal therapy may be more appealing to select adult and pediatric patients with accessible, focal temporal lobe lesions who may be willing to accept lower efficacy in exchange for potentially better cognitive outcomes and quality of life. A repeat procedure or subsequent surgical resection may be necessary for the best chance of seizure freedom.

Guidelines

An American Society for Stereotactic and Functional Neurosurgery position statement recommends magnetic resonance-guided laser interstitial thermal therapy for patients with drug-resistant epilepsy who: 1) fail to respond to, or are intolerant to, at least two appropriately chosen antiepileptic medications at appropriate doses, and 2) have well-defined epileptogenic foci or critical pathways of seizure propagation accessible by the procedure. Evidence from large case series demonstrated safety and efficacy of magnetic resonance-guided laser interstitial thermal therapy in reducing seizure frequency that was nearly comparable to data obtained from case series of open surgical procedures. Longer-term outcome data are needed, but they should be weighed against the other benefits of a minimally invasive option such as shorter hospital stays, less surgical and neurological morbidity, and the ability to access deep or difficult-to-access targets (Wu, 2021).

Neither the American Academy of Neurology (2026) nor the American Epilepsy Society (2026) addresses laser interstitial thermal therapy in their evidence-based guidelines or practice parameters.

Evidence reviews

The evidence from systematic reviews and meta-analyses of laser interstitial thermal therapy outcomes consists of retrospective and prospective nonrandomized studies. Short follow up periods, small sample sizes, and inconsistent reporting of complications, particularly those affecting neurological outcomes, limit the ability to assess its relative safety, durability, and overall effectiveness as a first-line surgical option for patients with drug-resistant, medically-intractable temporal lobe epilepsy with different disease etiologies.

The majority of participants experienced seizure onset in childhood and were adults at initial laser interstitial thermal therapy. Most procedures targeted focal lesions in the mesial temporal lobe or hypothalamus and were evenly distributed between both hemispheres. Non-temporal neocortical targets included the insula, frontal, parietal, and occipital lobes (Chen, 2023).

Compared to open surgical resection, laser interstitial thermal therapy is a safe procedure, may be as effective for achieving freedom from seizures (Engel class I outcomes), and is associated with fewer postoperative neurological deficits (Haro-Perez, 2025; Maroufi, 2026; Stavrogianni, 2026; Wang, 2020). In matched-cohort

analyses, both laser interstitial thermal therapy and surgical resection achieve similar seizure freedom rates, while laser interstitial thermal therapy offered significantly shorter lengths of hospital stays and lower complication rates (Pichardo-Rojas, 2026). Approximately 8% to 15% may require revision epilepsy surgery or laser interstitial thermal therapy after the index procedure (Chen, 2023; Winslow, 2025; Woods, 2025). Winslow (2025) reported achieving seizure freedom in 51.2% after additional laser interstitial thermal therapy and in 62.9 % after subsequent surgical resection.

In adult and pediatric patients with medically refractory generalized epilepsy, corpus callosotomy and laser interstitial thermal therapy are palliative options for nonresectable foci. Both procedures were associated with similar overall seizure freedom rates (P = .25), drop attack freedom rates (P = .34), and greater than 50% seizure reduction rates (P = .78). Laser interstitial thermal therapy was associated with shorter hospital stays (median: 2 vs. 6 days; P < .0001) but with more subsequent epilepsy surgeries (24.4% vs 10.1%; P = .0003) (Merenzon, 2026).

Two analyses highlight the challenge in quantifying functional and neurocognitive outcomes following laser interstitial thermal therapy. Data on these outcomes are limited, and data collection is heterogeneous. Alomar (2023; n = 836) reported an overall complication rate of 19.8%, with observed declines in verbal memory (24.2%), visual memory (25.2%), and naming (13.4%). The rate of visual field deficit was 7.8%, and the median follow-up period was 21.3 ± 10.42 months. Brenner (2024; n = 408) reported rates of decline in verbal cognition (20.4%) and visual cognition (13.5%), and variable rates of decline in other functional outcomes (cognitive emotion, visual deficits, attention/processing, motor cognition, and general executive function), ranging from 10.5% to 25%. Both study groups call for standardized reporting to better capture procedure risk that impacts quality of life.

Pediatrics

Pediatric patients with drug-resistant epilepsy may also be candidates for this therapy, although studies typically are limited by small numbers of participants and short follow up periods. A systematic review of 240 pediatric participants from five non-randomized studies observed no statistically significant difference between laser interstitial thermal therapy and open surgical corpus callosotomy with respect to Engel outcome (P = .36), but laser interstitial thermal therapy was associated with a lower mean hospital length of stay (P < .00001), lower mean blood loss (P < .00001), and longer operating time (P = .00002) (Larcipretti, 2024).

Woods' (2025) individual participant data meta-analysis attempted to identify independent predictors of seizure outcomes and operative and neurological complications among participants who underwent magnetic resonance-guided laser interstitial thermal therapy and had at least 12 months of follow-up. The population comprised 354 participants with a mean age at seizure onset of 4.52 years, predominately focal seizures (in 85.5% of cases) and lesions detected on magnetic resonance imaging (in 82.1% of cases). The most common epilepsy etiologies were hypothalamic hamartoma (23.7%) and malformations of cortical development (23.7%). Engel class I outcomes were achieved in 57% of patients, and 8.2% underwent revision epilepsy surgery. Where postoperative neurological information was available, 35 of 205 cases (17.1%) experienced complications, of which hemiparesis was the most frequent (n = 16; 7.8%).

No operative or clinical characteristics were associated with seizure recurrence. Positive findings on magnetic resonance imaging indicative of structural lesions (e.g., hypothalamic hamartoma) were associated with higher seizure freedom probability (P = .012) and reduced odds of postoperative neurological complications (P = .031). Mesial temporal sclerosis was associated with earlier seizure recurrence (P = .023), and an extratemporal surgical location was associated with longer seizure freedom probability (P = .034) (Woods, 2025).

Hypothalamic hamartoma

Hypothalamic hamartoma is a rare congenital ventral hypothalamus malformation. The location of these lesions makes them challenging to reach microsurgically and often do not respond to pharmacotherapy. For the surgical

management of hypothalamic hamartoma-related epilepsy, the evidence comprises a limited quantity of single cohort studies. Indirect comparison of surgical techniques suggests that laser interstitial thermal therapy offers at least comparable safety and efficacy for achieving freedom from seizure. Adverse effects included electrolyte imbalances, weight gain, and transient neurologic disturbances (Ahmed, 2024; Luisi, 2024; Niazi, 2024). Larger prospective clinical trials comparing laser interstitial thermal therapy to open surgery that report longer follow up data and cognitive and psychiatric outcomes are needed.

In 2022, we updated the references with no policy changes warranted.

In 2023, we updated the references and modified the medical necessity criteria to reflect the growing literature supporting a clinical benefit of laser interstitial thermal therapy as a minimally invasive alternative to open surgery for patients with focal drug-resistant epilepsy.

In 2024, we deleted several references and added two updated systematic reviews and meta-analyses (Alomar, 2023; Brenner, 2024) to the policy with no policy changes warranted.

In 2025, we updated the references with no policy changes warranted.

In 2026, we updated the references with no policy changes warranted.

References

On May 26, 2026, we searched PubMed and the databases of the Cochrane Library, the U.K. National Health Services Centre for Reviews and Dissemination, the Agency for Healthcare Research and Quality, and the Centers for Medicare & Medicaid Services. Search terms were “interstitial laser therapy,” “laser interstitial thermal therapy,” “laser induced ablation,” “laser thermal ablation,” “laser induced thermotherapy,” “NeuroBlate,” “visualase,” and “epilepsy.” We included the best available evidence according to established evidence hierarchies (typically systematic reviews, meta-analyses, and full economic analyses, where available) and professional guidelines based on such evidence and clinical expertise.

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Policy updates

6/2014: initial review date and clinical policy effective date: 9/2014

6/2019: Policy references updated. Policy number changed to CCP.1111.

6/2020: Policy references updated.

6/2021: Policy references updated.

6/2022: Policy references updated.

6/2023: Policy references updated. Coverage modified.

6/2024: Policy references updated.

7/2025: Policy references updated.

7/2026: Policy references updated.

Related codes

Below are the most commonly submitted codes for the service(s)/item(s) subject to this policy CCP.1111. This is not an exhaustive list of codes. Providers are expected to consult the appropriate coding manuals and bill accordingly.

Code	Code description
61736	Laser interstitial thermal therapy (LITT) of lesion, intracranial, including burr hole(s), with magnetic resonance imaging guidance, when performed; single trajectory for 1 simple lesion
61737	Laser interstitial thermal therapy (LITT) of lesion, intracranial, including burr hole(s), with magnetic resonance imaging guidance, when performed; multiple trajectories for multiple or complex lesion(s)