Epilepsy Surgery

A guide for adults considering surgery to control or eliminate epilepsy seizures

Neurosurgery One

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Are You a Candidate for Epilepsy Surgery?

If you have epilepsy and medication isn't controlling your seizures to the extent you would like, it might be time to consider surgery.

Thanks to advancements in technology and epilepsy research, nearly every adult with uncontrolled seizures is now a candidate for epilepsy surgery. You do not have to wait a certain amount of time before considering epilepsy surgery, and research shows that earlier surgery may be better.

Candidates for epilepsy surgery typically must meet only two criteria:

- Seizures failed to be controlled with at least two different types of anti-epileptic drugs (AEDs)
- General good health

Mental health issues are often a result of dealing with uncontrolled seizures or socioeconomic issues caused by seizures and do not disqualify you from surgery.

Don't Delay

Adults with epilepsy are often told they have to try medications for years before considering surgery, but that is not true. Studies show that patients who undergo surgery combined with medication are much more likely to have their seizures eliminated. For patients with frontal lobe epilepsy, younger age and less time since onset result in better seizure outcomes.[3] Getting seizures controlled early also improves job retention and reduces anxiety and depression related to uncontrolled seizures.

Epilepsy Surgery Reduces Seizures for Many

Medications do not control seizures in nearly 40% of adults.[1] For patients who do not respond to medications, **epilepsy surgery eliminated disabling seizures in approximately 60% of patients**. For patients who did not undergo surgery and continued solely with medication, approximately 10% were seizure-free.[2]

(See multiple studies on page 14.)

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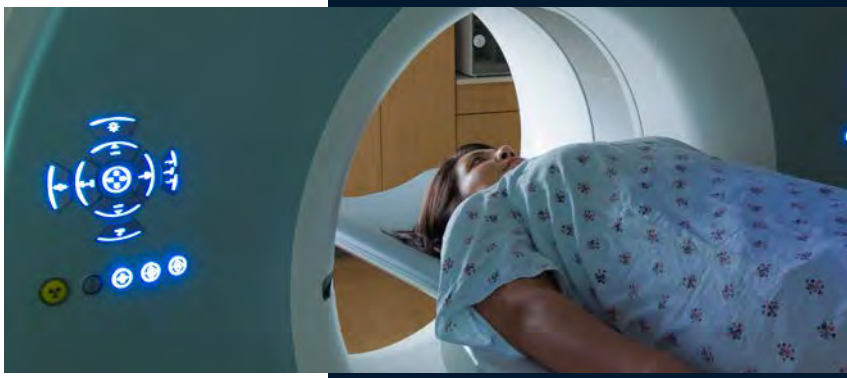
Steps and Tests to Assess Epilepsy Surgery Options

To determine which type of seizure surgery may be right for you, Neurosurgery One partners with you through the following steps:

1. Our neurosurgeon who is specially trained in treating epilepsy will meet with you to determine your goals, review your seizure history to date, and discuss the process.
2. Teaming up with epileptologists at Littleton Adventist Hospital's Epilepsy Monitoring Unit, we will conduct noninvasive testing to locate the cause of your seizures.
3. Once the cause and location of your seizures are determined, our epilepsy neurosurgeon will meet with you to discuss the best surgical options for your specific condition and desires.



TESTS FOR EPILEPSY SURGERY SCREENING

Electroencephalogram (EEG) is a noninvasive test that evaluates the electrical activity in the brain. Electrodes are attached to your scalp, and testing can last anywhere from under an hour a day.

Electrocorticography (ECoG), also known as intracranial EEG (iEEG), is a procedure that records electrical activity in the brain by placing electrodes directly on an exposed surface of the brain.

Computerized tomography (CT) scan can reveal abnormalities in the brain that could be causing seizures. CT scans are noninvasive and use X-rays to attain cross-sectional images of the brain.

Magnetic resonance imaging (MRI) uses radio waves and magnets to create detailed images of the brain. MRI is noninvasive and can be used to detect abnormalities and lesions in the brain that could be causing seizures.

Positron emission tomography (PET) detects how the brain is functioning. PET scans are imaging tests that work by injecting a small amount of low-dose radioactive material into a vein before performing the scan.

Single-photon emission computerized tomography (SPECT) is a nuclear image scan that uses radioactive material and a special camera to create 3-D images to analyze brain function.

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Benefits and Types of Epilepsy Surgery

Epilepsy surgery has been a proven, safe, and effective option for epilepsy patients with uncontrolled seizures since the 1980s. Newer, minimally invasive surgery provides many patients with better overall experiences and decreased side effects. Epilepsy surgery now exists for poorly localized seizures, offering nearly every adult with epilepsy a surgical option.

Epilepsy surgery has been shown to provide the following benefits:

- Improvements in both social and cognitive measurements[4,5]
- Reduced risk of seizure emergencies, injuries, and death[6]
- Elimination or reduction in seizure medications
- Reduced likelihood of experiencing anxiety and/or depression[7]
- Increased likelihood of returning to work[8] and being able to drive[9]
- Reduced costs associated with epilepsy treatment[10]

Neurosurgery One's fellowship-trained neurosurgeons specialize in treating patients with epilepsy who could benefit from the following types of epilepsy surgery:

Resections: The most common type of epilepsy surgery, this procedure removes the small part of the brain causing seizures.

Thermal/Laser Ablation: Also known as laser interstitial thermal therapy (LITT), ablation uses laser heat to destroy the small area of the brain causing the seizures.

Responsive Neurostimulation (RNS)/NeuroPace: Similar to a pacemaker, this implanted device monitors brain waves and automatically sends electrical pulses when unusual patterns are recognized to interrupt seizure activity.

Vagus Nerve Stimulation (VNS): A pacemaker-like device is implanted in the chest, and a wire is wrapped around the vagus nerve in the neck. The device sends regular, mild electrical pulses to the brain to prevent seizures.

Deep Brain Stimulation (DBS): Approved by the FDA in late 2018 for use with patients with epilepsy, this system works similar to the NeuroPace system. Neurosurgery One is a world leader in performing DBS epilepsy surgery using robotic guidance while patients are asleep.

40 YEARS

Epilepsy surgery has been **used for four decades** to help patients gain control of seizures.

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Epilepsy Surgery: Resections

Resections involve removing a small portion of the brain responsible for causing seizures. This area of the brain is referred to as the seizure focus. Resections are the most common type of epilepsy surgery performed.

BEST RESECTION CANDIDATES

Resections are typically options for epilepsy patients whose seizures:

- Originate from noncritical brain regions, meaning that they don't affect movement, speech, vision, or memory
- Arise from one area of the brain

RESECTION BENEFITS

There are three types of resection surgeries meant to control or eliminate epilepsy seizures:

- Temporal lobe resection is the most common type of epilepsy resection surgery and has the highest success rate. Nearly 70 percent of people who undergo a temporal lobe resection experience no or rare disabling seizures following surgery. In temporal lobe epilepsy, surgery is superior to prolonged medical therapy.
- Frontal lobe resection is the second most common type of epilepsy surgery. Although its success rates are not as high as temporal lobe procedures, studies show that up to 50 percent of patients are seizure-free after surgery.
- Parietal and occipital lobe resection provides the highest chance of success in patients who have a structural abnormality, such as a tumor or scar tissue, that causes seizures.

RESECTION CONSIDERATIONS

As with all brain surgeries, risk of infection, speech or memory issues, stroke, loss of motor skills or vision, and an increase in seizures are possible side effects of resections. Similar to craniotomy recovery, patients typically spend 1-2 days in the ICU after surgery and then 1-2 days recovering in the hospital before going home. Occasionally, epilepsy surgery patients may need inpatient rehabilitation before going home.

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Epilepsy Surgery: Thermal/Laser Ablation

Thermal/laser ablation is a minimally invasive procedure that uses MRI to guide a small probe to the area of the brain responsible for causing seizures. Also known as laser interstitial thermal therapy (LITT), this procedure uses laser heat to destroy the area responsible for the seizures.

BEST LITT CANDIDATES

People with epilepsy of the following types typically benefit most from thermal ablation, or LITT:

- Patients with mesial temporal lobe epilepsy typically benefit most from LITT, compared to other surgical options like resections that could bring higher rates of side effects like memory decline
- Patients with dominant-side temporal lobe epilepsy are also typically candidates for LITT
- Patients whose seizures are caused by lesions, such as a blood vessel or small brain malformation or hypothalamic hamartoma

LITT BENEFITS

This minimally invasive epilepsy surgery procedure is effective, with patients experiencing up to 60 percent seizure freedom.[11] Because thermal ablation is minimally invasive and has pinpoint accuracy, recovery time is reduced, as compared to more invasive epilepsy surgery options. Patients typically have minimal discomfort after the procedure and only spend 1-2 days in the hospital after the procedure.

LITT CONSIDERATIONS

Compared to resections, LITT patients have a lower chance of seizure recurrence. Yet, side effects of LITT are less severe, particularly when seizures originate from parts of the brain that are difficult to access or remove.

Side effects of LITT can include swelling and headaches, which are often controlled with medication. Rarely, side effects may include complications such as nerve damage, brain bleeds, or vision impairments.

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Epilepsy Surgery: Responsive Neurostimulation (RNS)/NeuroPace

Responsive neurostimulation (RNS) uses a medical device, known as NeuroPace, to observe and address brain activity causing seizures. Much like a heart pacemaker, the NeuroPace is implanted in the body and then automatically detects unusual brain patterns and sends electrical pulses to interrupt seizure activity. Once programmed, people cannot feel the stimulation.

RNS CANDIDATES

Epilepsy patients with focal or partial seizures are typically candidates for RNS. Patients who cannot have resection surgery to remove the portion of the brain where seizures start or for whom resection surgery did not work may benefit from RNS.

RNS BENEFITS

Approximately 50% of people who undergo RNS have positive results. Studies show that the benefits from RNS increase over time, with more than 60% of patients experiencing seizure freedom 3-6 years after surgery.[12]

RNS is reversible as it does not remove any portion of the brain. However, the neurostimulator is placed under the scalp in the skull, which does require more invasive techniques than other nonresection options like Deep Brain Stimulation (DBS). Typically, patients only remain in the hospital for 1-2 days. RNS also has fewer stimulation-related side effects than other stimulation-type epilepsy surgery.

RNS CONSIDERATIONS

Like any surgical procedure, RNS has a low risk of infection or bleeding. There are also lower rates of seizure control in some patients, compared to resection.

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Epilepsy Surgery: Vagus Nerve Stimulation (VNS)

Utilizing the vagus nerve in the neck, **vagus nerve stimulation (VNS)** sends regular, mild electrical pulses to the brain to control seizures. A wire is attached to the vagus nerve and then a pacemakerlike device is implanted in the chest to send the electrical pulses. VNS sends consistent, regular nerve stimulations, and patients also can activate the device through a special magnet if they feel a seizure occurring. Newer technology enables VNS to respond to a patient's heart rate.

VNS CANDIDATES

Epilepsy patients with focal or partial seizures that are not controlled by medications may benefit from VNS. Some people with Lennox-Gastaut syndrome have found benefits from VNS.

VNS BENEFITS

VNS has been shown to reduce the length, frequency, and severity of seizures. Although complete seizure elimination is not possible with VNS, the procedure is an option for people who do not want to go through more invasive brain surgery. VNS is reversible and the most minimally invasive of all epilepsy surgical options.

Approximately 50% of patients undergoing VNS experience a reduction of seizures within four months of surgery, with up to 60% of patients having positive results 2-4 years after surgery.[13]

Patients typically go home the same day as VNS surgery. The VNS device is programmed in an outpatient setting a few weeks after surgery. For patients who try VNS and don't find success, other epilepsy surgeries may still be options.

VNS CONSIDERATIONS

Side effects of VNS may include hoarseness, sore throat, coughing, infection, or bleeding. VNS is not recommended for people who have throat disorders.

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Epilepsy Surgery: Deep Brain Stimulation (DBS)

Deep Brain Stimulation (DBS) is a neuromodulation therapy that utilizes electrical stimulation to control areas of the brain causing seizures. Electrodes are placed in the areas of the brain causing seizures, and a neurostimulator is programmed to send pulses through the electrodes to the target area.

Although DBS for epilepsy seizures was only recently approved by the FDA, Neurosurgery One has been a world leader for years in performing DBS using robotic guidance while patients are asleep for other conditions.

DBS CANDIDATES

DBS is often a preferred surgical option for patients with limbic epilepsy and adults with generalized epilepsy. DBS may be an option for epilepsy patients who cannot benefit from resection surgery, which removes a portion of the brain causing seizures.

DBS BENEFITS

DBS is reversible as it does not remove or change any portion of brain tissue. A long-term study found that patients with drug-resistant epilepsy who underwent DBS of the anterior nucleus of the thalamus (ANT) experienced sustained seizure reduction with minimal side effects. Five years post-surgery, patients experienced a reduction in seizure frequency by up to 69%.[14]

DBS CONSIDERATIONS

DBS has a low risk of side effects, including bleeding, infection, memory issues, and depression. There are also risks associated with the implanted device, including infection and, rarely, mechanical or electrical issues.

The benefits of DBS may not be realized until up to two years after surgery.

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Comparing Epilepsy Surgeries

Your Neurosurgery One epilepsy team will assess which surgical options may be best for you. Here is a brief overview of the surgical options offered by Neurosurgery One.

SURGERY TYPE	Invasiveness	Reversible	Requires an Implanted Device	Average Hospital Stay	Medication Usage After Surgery	Average Success Rate
Resection	Most invasive; brain surgery			1-2 days in ICU; 1-2 additional days in general recovery	Medications may be reduced and, for some patients, eliminated	70% or higher seizure-free rate
Thermal/ Laser Ablation (LITT)	Most minimally invasive surgery			1-2 days	Medications may be reduced and, for some patients, eliminated	Up to 60% seizure-free rate
RNS	Moderately invasive; requires device placement in skull	✓	✓	2-3 days	Requires continued medication use, but usage may be reduced	Up to 60% seizure-free rate 3-6 years post surgery
VNS	Minimally invasive	✓	✓	Return home same day	Requires continued medication use, but usage may be reduced	Up to 60% seizure-free rate 2-4 years post surgery
DBS	Moderately invasive; requires a small "burr hole" in the skull	✓	✓	1-2 days	Requires continued medication use, but usage may be reduced	Up to 70% seizure-free rate 5 years post surgery

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How to Select Your Neurosurgeon

Choosing a neurosurgeon for your epilepsy surgery should be an important part of your process. To help you find a neurosurgeon you trust and who can help you accomplish your goals, consider asking:

- Do you have extensive training, or are you fellowship-trained in neurosurgery?
- Do you specialize in the treatment of epilepsy?
- Have you completed this procedure before? If so, how many times?
- What are the most common complications of this procedure?
- What is your infection rate?
- What is your patients' success rate with seizure freedom from this type of surgery?
- What does recovery from this procedure entail?
- When can I expect to experience results from the surgery? How long will it take to experience the full benefit?
- Where do you perform surgery?
- Which types of epilepsy surgery do you perform? *(You want to be sure your neurosurgeon is able to offer you the option best suited to your condition and desires.)*

It is also important that you are comfortable with your neurosurgeon and his/her staff before you move forward with epilepsy surgery. Consider:

- How do you feel when you walk into the office?
- Do you feel comfortable with the neurosurgeon? Can you talk easily to the neurosurgeon?
- Are the neurosurgeon and staff friendly and competent in addressing your concerns and understanding your goals?
- Do you feel like you have the neurosurgeon's full attention? Do you have enough time with the neurosurgeon?
- How do you feel about the access you have to the neurosurgeon and/or staff? Can you call, text, email directly, or do you need to work through an assistant or nurse?
- Is the staff helpful with paperwork, travel plans, scheduling, etc.?

About Neurosurgery One

At **Neurosurgery One**, we put you first, ensuring that your questions and needs are addressed every step of the way. Our team provides neurosurgeons expertly trained specifically in epilepsy surgery. Because they perform all types of epilepsy surgery, they can offer customized epilepsy surgery options customized for your specific form of epilepsy, your goals, and also your comfort level with various forms of surgery.

Our neurosurgeons and staff of Neurosurgery One take pride in providing patients with unbiased information that is supported by medical research. We are committed to offering patients information on all treatment options, whether those options are delivered by our practice or we need to make a referral to another specialist.

Why choose Neurosurgery One?

- Fellowship-trained neurosurgeons specializing in epilepsy surgery
- Latest surgical advancements, including minimally invasive surgery and robotic-guided procedures
- Complication and infection rates equal or better than national averages
- Unbiased information supported by medical research
- Perform all epilepsy surgery at Littleton Adventist Hospital, which houses one of the region's leading Epilepsy Monitoring Units

Neurosurgery One's main Denver location for epilepsy treatment is next to Littleton Adventist Hospital, just off C-470 and South Broadway Boulevard. We also assess patients in our Parker clinic.

Arapahoe Medical Plaza III
7780 S. Broadway, Suite 350
Littleton, CO 80122

Parker
9403 Crown Crest Blvd., Suite 200
Parker CO 80138

To schedule an appointment with one of our epilepsy specialists, please call 720.638.7500.

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Neurosurgery One's Epilepsy Neurosurgeon

Dr. David VanSickle, board certified by the American Board of Neurological Surgery, specializes in helping patients with epilepsy, Parkinson's and other movement disorders gain years of active, fulfilling life through the most current surgical procedures. Dr. VanSickle, who is also the medical director of Neurosurgery One's Denver DBS Center, helped pioneer the use of robotic-guided deep brain stimulation while patients are asleep and achieves results that far exceed national averages for effective outcomes and low complication rates.

Neurosurgery One's epilepsy neurosurgeon provides telehealth and in-person patient consultations and perform surgery at Littleton Adventist Hospital, which features a specialized Epilepsy Monitoring Unit and Neurosciences Center. *(See following page for more information.)*

To schedule an appointment, please call 720-638-7500.

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Epilepsy Surgery at Littleton Adventist Hospital

At **Neurosurgery One**, our neurosurgeons perform all epilepsy surgeries at Littleton Adventist Hospital, which houses one of the region's leading Epilepsy Monitoring Units. At Littleton Adventist Hospital, patients receive a high level of individual attentiveness by physicians and staff of a smaller community hospital can while also receiving the expertise and technology of a large university medical center.

Littleton Adventist Hospital offers:

- A neuro ICU staffed with nurses specially trained in neurological care
- 24/7 neurointervention, neurosurgery, and neurology coverage
- Neurohospitalist coverage during the day
- State-of-the-art surgical equipment
- A Level 2 Trauma Center
- Epilepsy Monitoring Unit

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Other Services Provided by Neurosurgery One

Neurosurgery One is Denver's most comprehensive neurosurgical practice. In addition to treating brain, skull base, and pituitary tumors, we also provide:

- Comprehensive spine care, including nonsurgical pain management, spine surgery, minimally invasive cervical disc arthroplasty, and complex spine deformity surgery
- Sacroiliac joint dysfunction diagnosis and treatment, including SI fusion
- Robotic-Assisted Asleep Deep Brain Stimulation (DBS)
- Three types of surgery for trigeminal neuralgia (TN)
- Neuromodulation for pain
- Surgery for brain and spine tumors
- Stereotactic radiosurgery
- Vagal nerve stimulation, responsive neurostimulation, DBS, and laser ablation for epilepsy
- Vascular surgery for aneurysms and arteriovenous malformations
- Peripheral nerve surgery
- Treatment for normal pressure hydrocephalus
- Emergency surgery for traumatic brain and spine injuries
- Carpal tunnel syndrome

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Locations

Neurosurgery One has six locations across the Denver area.

Castle Rock 4350 Limelight Ave., Suite 100 • 80109

Lakewood 11750 W. Second Place, Suite 255 • 80228

Littleton 7780 S. Broadway, Suite 350 • 80122

Lone Tree/Park Meadows 9980 Park Meadows Drive, Suite 101 • 80124

Lone Tree/Yosemite 9695 S Yosemite, Suite 377 • 80124

Parker 9403 Crown Crest Blvd., Suite 200 • 80138

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Expert Neurosurgeons

Neurosurgery One is pleased to offer one of the top teams for brain tumor surgery in the region.
Our neurosurgeons specializing in treatment of tumors include:

Wissam Asfahani, MD, FAANS, has 12 years of experience treating brain and spine disorders using surgical and nonsurgical therapies, including minimally invasive spine surgery.

Lloyd Mobley III, MD, FAANS, specializes in nonsurgical management and minimally invasive surgery for spine disorders, as well as complex surgical procedures for spine and brain conditions.

Angela M. Bohnen, MD, FAANS, is fellowship trained in the management of complex brain tumors and performs specialized brain tumor surgery.

J. Adair Prall, MD, is a national expert on trigeminal neuralgia and also specializes in treating complex tumors, vascular malformations, and spinal disorders.

John Hudson, MD, PhD, is an expert in neuroendoscopic and other minimally invasive approaches to brain surgery. He also provides treatment for general spinal disorders.

David VanSickle, MD, PhD, is one of the country's preeminent surgeons pioneering the use of Asleep DBS surgery. He also provides treatment for brain tumors and spine disorders.

Meet Our Physiatrists

Neurosurgery One is pleased to offer comprehensive spine care, including nonsurgical pain management with our three physiatrists.

Erasmus G. Morfe, DO, FAAPMR, is a board-certified physiatrist with 14 years of experience in interventional pain management. He treats spine pain using nonsurgical techniques and performs electrodiagnostic studies (EMG/NCS) as well as ultrasound-guided injections.

Jason Peragine, MD, FAAPMR, is board-certified in physical medicine and rehabilitation as well as pain medicine. He performs a wide variety of complex pain management procedures, with extensive experience in cervical spine treatments.

Esther D. Yoon, MD, FAAPMR, is a fellowship-trained and board-certified physical medicine and rehabilitation physician who specializes in interventional spine and musculoskeletal medicine, and pain management. She treats a wide range of spine and joint disorders.

Sources

[1]Kwan P, Brodie MJ. Early identification of refractory epilepsy. N Engl J Med. 2000;342(5):314-319.

[2]Devinsky O, Barr WB, Vickrey BG, et al. Changes in depression and anxiety after resective surgery for epilepsy. *Neurology*. 2005 Dec 13;65(11):1744-9.

[3]Simasathien T, Vadera S, Najm I, et al. Improved outcomes with earlier surgery for intractable frontal lobe epilepsy. *Annals of Neurology*. 2013 May;73(5):646-54.

[4]Taft C, Sager Magnusson E, Ekstedt G, Malmgren K. Health-related quality of life, mood, and patient satisfaction after epilepsy surgery in Sweden—a prospective controlled observational study. *Epilepsia*. 2014;55(6):878-885.

[5]Neal EG, Maciver S, Schoenberg MR, Vale FL. Surgical disconnection of epilepsy network correlates with improved outcomes. *Seizure*. 2020;76:56-63.

[6]Epilepsy Foundation. Risks and Benefits. 2020, April 2. Retrieved from www.epilepsy.com/learn/treating-seizures-and-epilepsy/surgery/risks-and-benefits.

[7]Devinsky O, Barr WB, Vickrey BG, et al. Changes in depression and anxiety after resective surgery for epilepsy. *Neurology*. 2005 Dec 13;65(11):1744-9.

[8]Zarroli K, Tracy JI, Nei M, et al. Employment after anterior temporal lobectomy. *Epilepsia*. 2011 May;52(5):925-31.

[9]Dawkins RL, Omar NB, Agee BS, et al. Assessment of driving outcomes after epilepsy surgery. *Epilepsy & Behavior*. 2015 Nov;52(Pt A):25-30.

[10]Schiltz NK, Kaiboriboon K, Koroukian SM, et al. Long-term reduction of health care costs and utilization after epilepsy surgery. *Epilepsia*. 2016 Feb;57(2):316-24.

[11]Kang JY, Wu C, Tracy J, et al. Laser interstitial thermal therapy for medically intractable mesial temporal lobe epilepsy. Epilepsia. 2016 Feb;57(2):325-34.

[12]Bergey, GK, Morrell, MJ, Mizrahi, EM, et al. Long-term treatment with responsive brain stimulation in adults with refractory partial seizures. *Neurology*. 2015;84(8):810-7.

[13]Englot DJ, Rolston JD, Wright CW, Hassnain KH, Change EF. Rates and predictions of seizure freedom with vagus nerve stimulation for intractable epilepsy. *Neurology*. 2016;79(3):345-353.

[14]Salanova V, Witt T, Worth R, Henry TR, Gross R, et al. Long-term Efficacy and Safety of Thalamic Stimulation for Drug-Resistant Partial Epilepsy. *Neurology*. 2015 Mar 10;84(10):1017-25. https://doi.org/10.1212/wnl.0000000000001334

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