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# Temporal lobe epilepsy surgery

## What is the best approach?

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In the article “Systematic review and meta-analysis of standard vs selective temporal lobe epilepsy surgery,” Dr. Josephson and colleagues<sup>1</sup> analyze information that might answer a simple question: if a person needs temporal lobe surgery, which procedure is better? This question has been a matter of debate for many years. It seems like a simple question. However, there is still no clear answer.

Before addressing the question, it is important to consider the issues that are involved. Both procedures are performed in order to stop seizures in people who have temporal lobe epilepsy (TLE). In other words, these are people who have seizures that start in one of their temporal lobes.

That definition seems reasonably straightforward. However, there are many places within the temporal lobe from which seizures may begin. Most doctors divide patients depending on how “deep” the seizures start. If the seizures start from the deeper temporal structures, like the hippocampus (an important part of our memory circuit), they are generally referred to as mesial. If the seizures start on the surface of the temporal lobe (in other words, not as “deep”), they are often referred to as lateral or neocortical.

This distinction is not arbitrary. The causes of mesial seizures are often different from the causes of lateral seizures. The EEG patterns of each type of seizure are different. An MRI may show mesial temporal sclerosis, a kind of scarring in the deep temporal lobe, if a person has mesial onset seizures. An MRI may show another kind of problem (like a scar due to a head injury) if the seizure has a lateral onset.

In order to stop seizures, it has long been thought that the entire area that causes the seizures must be removed. More recent studies have suggested that in certain instances, this may not be true. However, for the most part, surgical studies have reported the same finding: take out all of the area that causes seizures, and the seizures are much more likely to stop. One of the reasons that this is important in TLE is that one kind of temporal lobe seizure may respond better to one kind of surgical treatment. Unfortunately, there have been very few studies that have examined this.

In addition to seizure control, there is concern that surgery could cause a new neurologic problem. In order to stop the seizures, a part of the brain is removed. The

larger the area that is removed often means a higher likelihood of having new problems after the surgery. In other words, when thinking about surgery for seizures, it is important to look at both the benefits (stopping seizures) as well as the risks (like new problems) as a result of the surgery. When comparing two procedures for temporal lobe surgery, the authors tried to better understand the risks.

**WHAT IS A META-ANALYSIS?** A meta-analysis refers to a specific way of comparing and contrasting the combined results from different studies. The hope of a meta-analysis is to identify patterns that may not be possible to see in smaller studies. Further, a meta-analysis might identify interesting relationships that can only be seen when more information is available. The strength of the meta-analysis lies in the larger number of people that can be included. However, individual studies are not performed in exactly the same way every time. Sometimes, this makes “lumping” the information very difficult.

For instance, in the current study, the authors looked for studies that compared two different surgical techniques: anterior temporal lobectomy (ATL) vs selective amygdalohippocampectomy (SAH). This sounds easy; however, there is not a single universally accepted way of doing either of these procedures. For instance, SAH can be done via a transsylvian approach or a transcortical approach. Often, the neurosurgeon chooses which procedure to perform. In part, this may be based on the surgeon’s own experience and training. Other factors that may go into the surgical decision include variations in anatomy. Although people generally the same, there are minor differences in their brain anatomy. For instance, one person may have an important blood vessel that is “in the way” of the surgery. In another person, the blood vessel is in a different location, and presents no problem for the surgical procedure. These differences have to be factored into the surgeon’s decision-making.

**METHODS** To find the information for their meta-analysis, the authors looked through two very large medical literature databases: Medline and Embase. They looked for any article, searching as far back as 1946 or 1947. They found 65 articles that seemed relevant. Of these, there were 13 articles that met the specific criteria they had laid out beforehand. More

specifically, there were 13 articles that compared ATL and SAH.

It was important to know how the people did after surgery. The authors specifically looked for the number of people who did very well after surgery. These are people who fall into the Engel Class I or II categories. Engel I means that a person was seizure-free (no seizures at all) or experienced auras only after surgery. Engel II means that a person had <2 disabling seizures per year after surgery or nondisabling seizures in sleep only. The authors compared these groups to Engel II and IV: the people who did not do so well after brain surgery for their seizures.

**RESULTS** Within the 13 articles, there were 1,294 patients. Six of the articles were prospective, meaning that the authors collected the information after designing the study. In 6 articles, the information was collected retrospectively, meaning that the authors looked backwards using patient charts, to see how well their patients did after temporal lobe surgery. In one of the articles, the method of data collection was not clearly stated.

Nine of the 13 articles described the medical testing that was needed before surgery was performed. Standard testing like MRI and video-EEG monitoring were performed in nearly all patients. Neuropsychological testing occurred in 85% of patients. Although other tests like magnetoencephalography (MEG), functional MRI (fMRI), positron emission tomography (PET), and single photon emission computed tomography (SPECT) may have been done, they were not used in all of the studies. This makes sense. Remember, Dr. Josephson and colleagues used articles going back to the 1940s. Some of the tests that we use routinely today were not available back then.

When Dr. Josephson and colleagues looked at the studies, they were able to compare Engel I vs Engel II–IV in 1,203 patients. Of these, 583 had a SAH while 620 had ATL. When comparing ATL vs SAH, there was a statistically significant difference that favored ATL. In other words, there was a higher likelihood that a

person with TLE would be Engel I (seizure-free or having auras only) after ATL as compared to SAH.

Five of the 13 articles described surgical complications. In these articles, there were 701 patients. The risk of serious neurologic injury or death was 0%–3.1% for SAH and 0%–2.4% for ATL. In short, there was no difference in the serious possible complications from the procedures.

Dr. Josephson and colleagues tried to evaluate other kinds of neurologic problems after surgery, like memory difficulties. Neuropsychological (NP) testing is most often used to assess this. NP testing is a detailed way to measure brain performance. In many epilepsy centers, a person who is planning on having surgery will have this kind of testing both before and after their surgery. NP scores can go down after surgery (a complication). Often, though, NP scores go up when the seizures stop or when seizures have improved. Dr. Josephson and colleagues tried to evaluate changes in NP scores due to each of the procedures. However, this testing is not performed in a single, universally accepted way. This made “lumping” the data even more difficult, and they were not able to assess whether the NP test results were better after either of the studies’ surgical procedures.

**DISCUSSION** Epilepsy can be very difficult to manage with medications in about one-third of people. In these instances, surgery may help to stop the seizures. TLE is the most common kind of partial epilepsy. There are 2 main approaches to temporal lobe surgery: ATL vs SAH. In this study, Dr. Josephson and colleagues found that ATL was more likely to stop seizures than SAH. The surgical complications were identical. The one aspect that they could not accurately assess was whether there was a difference in NP function after these procedures. The findings are very helpful, but highlight the need for more study in this area.

## REFERENCE

1. Josephson CB, Dykeman J, Fiest KM, et al. Systematic review and meta-analysis of standard vs selective temporal lobe epilepsy surgery. *Neurology* 2013;80:1669–1676.

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# About epilepsy

**WHAT IS A SEIZURE?** A seizure is a disruption in the normal electrical activity of the brain. Normally the brain is very active, passing electrical messages back and forth between nerve cells. When a person has a seizure, there is abnormal firing of nerve cells and the messages become jumbled in part or all of the brain. A seizure may cause a variety of different symptoms, such as twitching or shaking in an arm, leg, one side of the face, or the whole body; repetitive movements or gestures; confusion; feelings of fear or other emotions; hallucinations (odd smells, tastes, sounds, or seeing things that are not there); loss of consciousness; and convulsions.

**WHAT IS EPILEPSY?** Epilepsy is an episodic recurrence of seizures that are not due to fever, active infection, drug effects, or other triggering causes. It may be caused by a variety of conditions that injure a part or all of the brain. This can be due to problems in development of the brain that occur before birth, inherited disorders of the brain or nervous system, brain trauma, brain tumors, stroke, infections, and poisoning. About 70% of cases have no known cause. Each year there are 125,000 new cases of epilepsy. About 2.5 to 3 million people in the United States have some form of epilepsy.

**WHAT IS PARTIAL EPILEPSY?** Seizures can be classified as either generalized or focal (partial is another term for focal). A partial seizure is one that originates from a specific area of the brain. This is different from a generalized seizure, where the seizure essentially starts “all over the brain” or “everywhere all at once.” Partial seizures are divided into different types. Partial seizures are called complex if they cause loss of awareness. When the person remains awake and aware of what is going on, the partial seizure is called simple. Another term for a simple partial seizure is an aura. It should be noted that even though the partial seizures start at a specific area of the brain, they can sometimes spread to other brain areas. When they spread to the whole brain, they look just like generalized seizures (with stiffening of the arms and legs, and shaking all over).

**WHAT ARE SOME OF THE TREATMENTS FOR EPILEPSY?** Even though epilepsy has been recognized as a disease since ancient times, it was not until 1857 that the first antiepileptic medication was discovered. Over the next 100 years, 9 medications were found to be effective in controlling seizures. In the last 18 years, the discovery rate is much higher, with 12 new medications approved for use by the Food and Drug Administration (FDA). Although there are many new medicines, approximately 30% of patients still have seizures that do not stop with medication. In addition, many people do not like their medication because of side effects.

In 1997, the FDA approved the first implantable device, called vagus nerve stimulator (VNS), as adjunct therapy for refractory partial seizures. The VNS sends a small electrical impulse to a nerve in the neck called the vagus nerve. This impulse travels back to the brain, where it helps to reduce or stop seizures. With this device, about 5%–6% of patients stop having seizures, and up to 70% find that their seizures are reduced by 50% or more.

In addition to medications and devices like the VNS, brain surgery can be a very effective way to stop seizures in people with partial epilepsy. Though effective, brain surgery carries a risk of bleeding, stroke, and infection. Though rare, these complications can sometimes cause permanent neurologic problems.

Many research studies on new treatments for epilepsy are currently underway. As new medications and implantable devices are being discovered, we are moving closer to our goal: better seizure control and few (or no) side effects.

## ADDITIONAL RESOURCES

AAN Patients and Caregivers site  
<http://patients.aan.com/golhome>

Epilepsy Foundation of America  
<http://www.epilepsyfoundation.org>

Citizens United for Research in Epilepsy (CURE)  
<http://www.CUREepilepsy.org>

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