

**TEMPORAL LOBE RESECTION
TAMPA GENERAL HOSPITAL, TAMPA, FLORIDA
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NARRATOR: Epilepsy is a misunderstood and often misdiagnosed disease that can be cured. Left uncontrolled, seizures can lead to self-injury, damage to the brain, early dementia, quality of life deterioration, and decreased life expectancy. During this live webcast, surgeons from Tampa General Hospital in Tampa, Florida, will perform a temporal lobe resection to control epilepsy.

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FERNANDO VALE MD: We look for subtle abnormalities, subtle findings, and we go to the depths of the temporal lobe to find the problem, disconnecting the abnormality from the rest of the brain.

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NARRATOR: Nearly 85% of those patients who undergo epilepsy surgery regain their independence and quality of life. At any time throughout this program, you may email questions to the physicians by clicking the MDirectAccess button on the screen.

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SELIM BENBADIS MD: Good afternoon everybody. This is Selim Benbadis. I'm Director of the epilepsy program here at Tampa General in the University of South Florida. We're going to have Dr. Vale say hi. Hi, Dr. Vale.

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FERNANDO VALE MD: Hi. Good afternoon.

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SELIM BENBADIS MD: We're going to have Dr. Vale show us exactly where he is at the moment.

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FERNANDO VALE MD: We are looking right now under the microscope. For all those that are joining us, I have already started the surgery. We are looking at deep inside the temporal lobe and this area that we're looking at here that looks kind of white is the cause of the patient's seizure disorder. This is what we call the hippocampus right here. I'm going to put an instrument to give you the details of the structure. I already performed part of the resection. This is basically to free the hippocampus from the surrounding brain tissue. To give you some orientation, where my suction is right now is the front of the patient. Where my suction is right now is the back of the patient. This is to the top and this is to the neck of the patient. This structure right here that I keep flipping around is the hippocampus. Down the road, Dr. Benbadis will show it to all of you in the MRI. I'd like to point to a few other structures that are of interest when it comes to the anatomy of this area. There is a retractor right here and this is what we call the choroid plexus. Basically, this is what is in charge of making cerebrospinal fluid, for those of you interested in the anatomy of the brain. Right here. The white structure underneath the choroid plexus is the roof of the ventricle. That's all related to the hippocampus. Again, Dr. Benbadis will go into detail while I continue to perform this delicate operation. On the other side of this hippocampus is the brain stem. These are thin membranes that cover the vascular structures of the brain stem. Basically, my goal is to separate this tissue from the rest of the brain and hopefully in that way control her seizures. That's why we're here today. Again, this is called the hippocampus and this is the suspected agent when it comes to seizures, at least in this patient. From a distance, it looks normal, but we know that underneath there is a lot of chemical abnormalities and electrical discharges that are the cause of the seizures. The idea today is to disconnect this from the rest of the brain, so hopefully this patient will be rendered seizure-controlled. I will leave Dr. Benbadis to talk to you for a little bit while I continue my work.

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SELIM BENBADIS MD: Okay, let's have a little background on this, just to remind you what epilepsy is. Epilepsy is defined as recurrent seizures. It affects about 1% of the population. Fortunately, about 70% of people with epilepsy can be successfully controlled with medication, but unfortunately, about 30% cannot. Despite trying multiple medications, different types, different combinations of medications, seizures do not become under control. This is quite common if you figure that 30% of patients of a disease that affects 1% of the population, you can easily see there are thousands of patients that would benefit from this type of intervention. So again, 30% of patients, toughly, do not respond to medication. It's also important to remember that when we treat patients with medications, which is what we neurologists do, medications come with side effects. When the seizures can only be controlled at the expense of side effects that reduce quality of life, this should be considered drug failure. Again, non-drug treatments should be considered and, of course, surgery is the most dramatic of those non-drug treatments. Specifically today we're talking about temporal lobe epilepsy, as Dr. Vale said. He is approaching part of the temporal lobe and temporal lobe epilepsy is one of the more common types of epilepsy and also one that tends to become difficult to control. Often, but not always, it's related to having had febrile seizures as a baby. It can begin at any time in your life. Temporal lobe epilepsy is more likely to be difficult to control than other types of epilepsies.

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So how do we get to this point? We get to this point by working with a team and this type of procedure for epilepsy is only done and should only be done at large and usually academic medical centers because it requires the effort of very specialized physicians. We have a group of neurologists that specialize in epilepsy and that means they have done a fellowship of a year or preferably two years, specializing in everything that can be done to diagnose and treat epilepsy. Our neurosurgeon, Dr. Vale, that you met previously, did a subspecialty training in epilepsy surgery. Then we work together with other specialists, neuroradiologists, neuropsychologists, and it's only by a teamwork approach like this that we can determine what is best for each patient and, even when surgery is considered, to come to an agreement as a team of what surgery is best for a given patient. Temporal lobe surgery, which we are looking at today, is by far the most common surgical procedure performed for epilepsy. In a center like here, where we do over 50 per year, about 40 of those, or about 80%, are temporal lobe resection and this is why we decided to show this today.

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We get to this point by doing a comprehensive preoperative evaluation that begins with EEG and MRI. These are the two key tests and then, when they allow to identify where the seizures are coming from, we can then proceed with more detailed testing. The full purpose of all this testing is to first make certain that the seizures are indeed epileptic seizures. Not everything that looks like a seizure is an epileptic seizure. Then, if it is an epileptic seizure, to determine where it's coming from in the brain. That's what EEG video monitoring, as well as neuro imaging, accomplishes. So here is a representation of what we do as a group. The clinical information, that's the analysis of what happens during the seizures. How does the patient behave? Does it point to certain areas of the brain? Electroencephalography or EEG, MRI. You have here on the right listed PET and SPECT. Those are nuclear functional imaging studies, which also give us additional information. Then neuropsychological testing and the Wada test, which is a specialized test that analyzes language and memory in each hemisphere. The purpose of this is to make certain that the part we will take out to control the seizure will not also take out important functions, such as language and memory. Do you want to show us where you are, Dr. Vale, before I continue?

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FERNANDO VALE MD: Absolutely. Right here, where we're working is what's called the tail of the hippocampus. The hippocampus, like probably anything else in life, has a head, a body, and a tail. We're working back now toward the posterior part of the head and we can see some of the structures right here. I don't know if you can get good anatomic detail. Let me try to focus my microscope so you can get a better ideal. A real important part of the brain. Right here you can see what we call the anterior choroidal artery. That's where my suction is pointing to. Again we see the choroid plexus. That is the structure in charge of producing CSF. That is brain fluid. At this point in time, we're just basically going to disconnect the tail of the hippocampus, using this burning instrument that is called a bipolar, and free it from the rest of the brain and try to remove the entire structure in one large block so we decrease the chances of any of this electrical activity recurring in the future. This is where we are. Like I said before, if Dr. Benbadis can point to the MRI, you can get an idea of where the hippocampus is. It is surrounded by really, really important structures, like the brain stem, the thalamus, and a lot of important

vascular supplies nearby, so we try to preserve those delicate structures while at the same time taking care of the problem, that is this area right here that we call, again, the hippocampus.

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SELIM BENBADIS MD: Thank you again for orienting us. I will show the MRI shortly. I just want to re-emphasize again that it's a complicated and multidisciplinary issue to get to this point of knowing where the seizures are coming from and whether this area can come out safely. So in surgery, somebody who's a candidate for surgery has to have intractable epilepsy and by that we mean medications don't work.

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We have email questions that are coming in all the time, and by the way, feel free to send some more, but they're often asking how many seizures should people have, when is it bad enough to have surgery? There is no number as an answer to this. If seizures are disabling, medications don't work, seizures can really change your life, so surgery should at least be investigated as a possibility.

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Like I indicated earlier, the two most important parts of the evaluation are EEG and MRI, even though we use other areas of neurology and neuroscience to localize seizure onset. To be a surgical candidate, like I said before, seizure onset has to be localized and the seizure focus has to be in an area that is accessible and can be removed without causing problems. Here we've summarized a typical abnormal MRI and a typical abnormal EEG because when these two pieces of information agree and point to the same area, the chances of becoming seizure-free are very high.

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We're going to look at a typical EEG of temporal lobe seizures now. You can see here, if you look at the top part of the tracing, there is what we call a spike or a sharp wave. These abnormalities are very, very helpful to point to a particular area, in this case the left temporal lobe. If you go to the next view and play them one after the other, you see the evolution of a change in the top four tracings. Go to the next, and the next, and now go back one. You see, if you look at the top 4 and then you skip 4, and the next 4 again, you see arrhythmic discharges. That's what we call it. The same wave that repeats itself all the time. It looks like a buzz. That's an ongoing seizure. By recording this, this one points to the left temporal lobe. If the MRI shows abnormalities as well, you have a very high chance that the resection of that area will cure the seizure.

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If we can move on to the MRI that Dr. Vale is eager for me to show, I will point out that this is an MRI on what we call a coronal plane. It's a coronal plane, which means you are looking like this, so this is the right and this is the left. If you look at the hippocampus, this is exactly where Dr. Vale is doing his busywork right now. This is the right hippocampus. This is the left hippocampus. You see a difference in what we call the signal. That indicates scar tissue. Again, in a patient like this, the EEG pointed to the same area and that predicts an excellent outcome with this kind of a resection. If you move to this film right here, you have another part of the evaluation that I mentioned briefly. I don't think it's showing too well on the view box there. That's a PET scan. It stands for positron emission tomography. Again, it compares the left and the right temporal lobe. You really can't see it too well. The view box is a little too bright, I think, but it looks differently at the same thing. If you can make it darker, you will see a difference between the left and right temporal lobe, particularly apparent on this cut here. Again, that corroborates our suspicion that this is left temporal. There are a couple of other procedures that are done. If everything lines up well, that's what we call the principle of convergence and that predicts an excellent outcome and that is how we decide who should undergo the procedure and who should not.

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This slide shows an MRI of a patient after a temporal lobectomy. You see again the hippocampus that Dr. Vale was pointing at earlier is essentially gone. You see a hole, as compared to the other side. That's the typical MRI of one of our patients that has received a temporal lobectomy. Again, we do about 55 surgeries for epilepsy a year here and about 40, 42, about 80% of them are temporal resections, such as what we are looking at today. Dr. Vale, show us where you are, please.

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FERNANDO VALE MD: Okay. Well, we're continuing to disconnect the area of abnormality from the rest of the normal brain. That's what I'm using this instrument for, the bipolar, to basically transmit a current and at the same time that prevents bleeding and splits the tissue in two. We have started to separate that from the rest of the brain, as you can see right here. It's coming in one little piece, together. That's what we're achieving a little

bit at a time, separating everything from the rest of the tissue. This takes a lot of time. It's delicate and this is what we're here for.

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SELIM BENBADIS MD: Dr. Vale, I have a question by email here. This is an easy one, so I'm going to start you off with an easy question. Can this operation be done without opening the skull?

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FERNANDO VALE MD: Absolutely not, unfortunately. There were some studies done that were using a different technique to control the epileptic seizures, but that is still under a lot of study. Up to this point, this is the most successful way of controlling epilepsy.

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SELIM BENBADIS MD: I didn't think so. Thank you. I have another question, which I will take, with your permission. The question is will there be problems with memory for the patient after surgery, since it seems that you're manipulating the hippocampus very much? The answer to this is in the test I mentioned earlier called the Wada test. This is a test where we put to sleep one temporal lobe at a time and test memory and language. What we like to demonstrate with that test is what the hippocampus, the part of the temporal lobe that we are considering taking out for seizure control, is not doing much contribution to memory. Most of these patients, by definition their hippocampus is not healthy and their memory is usually assumed by the other side, which is the healthy hippocampus. It doesn't always work out perfectly and sometimes the hippocampus we are removing does have some memory function, but most of it is usually in the healthy side, so usually there is no significant memory deficit after these operations, but again, this is why we do the testing.

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I have another easy one here. What is the maximum age for this type of operation? Dr. Vale knows full well that we have done this up to what age?

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FERNANDO VALE MD: Well, you know, we have a large range of patients. I believe that, I would not say our oldest, but our most mature patient was in his early 70s and our youngest patient is around 6 years old. There are other types of epilepsy surgeries that can be performed earlier on in life.

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SELIM BENBADIS MD: Our patient was in his early 70s. This is often found to be surprising, but really, if you consider that patients after this operation are typically in the hospital for 2-3 days, while this is brain surgery, it's a very, very safe procedure. Show us where you are while I peruse the questions.

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FERNANDO VALE MD: Okay. I basically disconnected the posterior part of the hippocampus from the rest of the tissue and I put this little pledget here. It's just basically a way to separate the tissue and also achieve hemostasis at the same time. You can see we have half of it kind of free and half of it still attached. That's where we're going to work on it. Still working on the hippocampus. What you see is the little layers of the brain that have attachment where the blood vessels go through. That's what we call the arachnoid. That's what we're separating right now, the arachnoid from the hippocampus formation. So it's all for you, Dr. Benbadis.

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SELIM BENBADIS MD: Thank you, very good. One of the questions here is does the patient stay awake during surgery? If not, how can you preserve the critical areas of tissue? Well, again, this can be done and occasionally we do these surgeries awake. That requires what we call mapping, where we test areas of cortex specifically to see can this come out, can this come out, can this come out? Because obviously if it is in charge of doing speech or vision or sensation, we should preserve those areas. Typically for temporal lobe epilepsy, such as this, it is not necessary to do this mapping because the areas that Dr. Vale is resecting are far away from any of what we call eloquent or critical cortex, so for this type of surgery usually the patient need not be awake.

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FERNANDO VALE MD: Can I add a little bit to that answer? In the hippocampus, we do test this area before we resect it. That's what Dr. Benbadis mentioned earlier. It's called a Wada test. It can be critical, but it's already tested and we know that beforehand. When it comes to the brain, it's all based on location. Based on the location, it will decide if this patient has to be done awake or just asleep. In this area, we tested all the

surrounding brain tissues, so the chance of causing any problems is extremely low, so that's the reason we do it asleep. It's probably better tolerated by the patient and that's the reason.

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SELIM BENBADIS MD: That leads me to another question here, which is can this be performed on the frontal lobe? The answer is of course yes. That's the second most common type of surgery, after the temporal lobe resection. For those, because the frontal lobe includes what we call the primary motor cortex, which is how you move your face, your hands, your feet, then we oftentimes do have to do mapping, which means identifying precisely what area of cortex is doing what so that Dr. Vale can stay away from it, as opposed to taking it out. Obviously, as a general principle, the more cortex you take, the better the seizure control because you take the seizure focus, but the more cortex you take, also the more potential for adverse reactions or deficits after surgery. So for frontal lobe surgery, you are more likely to have the patient awake and do some type of mapping.

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FERNANDO VALE MD: Okay, can I get everybody's attention now. This is the hippocampus right here. Basically I've freed it from the rest of the brain and it is mobile right now. I'm just going to take it in one piece, using this grabber, called a biopsy forceps. The specimen is coming out.

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SELIM BENBADIS MD: Tell us how big this piece is, roughly.

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FERNANDO VALE MD: Well, it could potentially be measured. We'll ask our helper, Adam, who is the scrub nurse, who is doing a magnificent job, to measure the length of that specimen. I'm going to just change the microscope and get an idea, a view of the specimen. I believe that I'm going to find it. There it is. I'm going to focus. Don't worry about it. This is what we have to deal with when we work under the microscope.

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SELIM BENBADIS MD: The point I'm trying to show is that it's a relatively small piece.

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FERNANDO VALE MD: This is basically what we call the head. This is part of the body right here. That's the area that points to the ventricles. That means it is surrounded by brain fluid. You can see it has attachments through all different parts. It's not that we can go there and just grab it and pull it out. You have to work around the tissue and basically free the specimen.

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SELIM BENBADIS MD: I want a measurement.

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FERNANDO VALE MD: I'm going to measure it for you. I see my friend here is impatient. We have close to 3 cm right there.

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SELIM BENBADIS MD: That's the entire length of the hippocampus.

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FERNANDO VALE MD: That's right. We have a little bit more that I'm probably going to trim when I go under the microscope again, but this is the main bulk of the problem.

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SELIM BENBADIS MD: Okay. Thank you. One of the things that I want to point out, because in a learning event like this, we want to make the major points. One of the major points is about 80% of people that receive this procedure at our center, but also at others, are seizure-free. 10% are markedly improved and 10% don't benefit. Complications are very rare. Unfortunately, despite the very high success rate, this type of procedure, epilepsy surgery, in general, is underutilized. Part of the reason for that is that both the community and the medical community are not aware that this is so successful and is standard of care. A few years ago, we published this paper that I'm showing here, where we outlined sort of what the strategy should be when medications don't work. One of the important things is nowadays it's well known that people should not be trying medications for 10 years, 15 years, 20 years before getting to the point of thinking surgery. In fact, we now know that if the first 2-3 drugs for epilepsy have not worked, it's very unlikely that drugs will ever control somebody's seizures, so we recommend and most epilepsy experts recommend early evaluation for epilepsy surgery. That means after the first 2-3 years and the first 2-3 drugs. Sadly right now, if you look at the numbers, most people who end up in

epilepsy surgery have waited over 15 years, so that's one of the reasons we do programs like this. Dr. Vale, I need to peruse the questions, show us what you are doing now that the hippocampus is out.

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FERNANDO VALE MD: Well, I'm just looking at the surrounding structures. I'm going to give our viewers an idea of where we are. I'm just getting prepared for that. So somebody is a little bit ahead of the game, so I'm glad that they're up to date. If you give me about 10 more minutes, I'll be ready to show everybody where we are and where we stand at this stage.

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SELIM BENBADIS MD: Alright, we'll give you 10 more minutes. Okay, I have a couple of interesting questions. One is the opposite of the previous one. Can this be done in children? How young a patient is accepted for epilepsy surgery? We do children, not as many as adults, but we should. This can be done very young. In children, other types of epilepsies are more common than mesial temporal lobe epilepsy, which is what is being taken care of today, and they oftentimes have resections outside of the temporal lobe, but it can be done in young children. The youngest we have done here so far, but it can be done younger, I believe is around 6.

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I have another question. It's a little bit personal. I will spare you the names. Somebody was not considered because both frontal lobes were damaged due to an accident. This is a very important question. Many times people are told they're not candidates for surgery. There are many reasons why somebody may not qualify for surgery, but unless the patient has been evaluated at an experienced epilepsy center, they should always approach that with a little caution because even people who have *brain damage* in both sides of the brain, oftentimes the seizures only come from one. For the purpose of treating seizures, all we want is to identify where the seizures are coming from. There may be some damage on the other side, but it's not necessarily generating the seizures.

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Another question is how long after surgery do people take medications? Usually at least a year and it's very, very gradual before we consider taking people off medications. By the way, I can't resist, but several of these emails are not questions; they're comments from our prior patients, so we collect those dearly. I have several. I just wanted to let you know.

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FERNANDO VALE MD: It's good to hear from them.

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SELIM BENBADIS MD: They say, *"Thank you, Dr. Vale, you changed my life,"* and the likes. *"I don't have a question, just a heartfelt thank you to Dr. Vale,"* etc., etc. So we're trying to be educational and I'll try to stick to the questions. Dr. Vale, where are you?

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FERNANDO VALE MD: Well, I'm in what we call the parahippocampal gyrus. That's next to the hippocampus. It just goes around the brain stem. That's what I was preparing. Now you can see the brain stem and see how many critical structures we work around. If I turn my microscope, that's what I'm going to do so everybody can get a better view.

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SELIM BENBADIS MD: By the way, one of the questions I just read is how long after surgery do you have to take medications? It's from one of our patients who is still considering getting this done. Go ahead. Sorry.

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FERNANDO VALE MD: I'm going to go ahead and show some people around. That structure that we see down there that looks white is the brain stem. That's where all the reflexes and activity that we take for granted is located. There are big arteries next to it that basically supply the rest of the brain. That tells you how many close ones we can have all the time, but at the same time tell you how well prepared you have to be to do one of these surgeries. It looks real nice. It's well preserved, looks completely normal. Then we're just moving back, following the pathway of the brain stem to the back of the brain stem. We want to make sure we remove as much as we can from the hippocampus and the surrounding tissues.

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SELIM BENBADIS MD: One question I have is what percentage of the surgeries are partial resection versus complete lobectomies?

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FERNANDO VALE MD: We don't do complete lobectomies.

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SELIM BENBADIS MD: I don't think you ever take out an entire lobe. They're called lobectomies, such as temporal lobectomy, but that's misleading, don't you think?

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FERNANDO VALE MD: Yes. That comes more from old-timers. That's the way it used to be called. There's nothing wrong to call it that way, but in reality, it never is a lobectomy, just a partial resection of the temporal lobe to the specific area of the problem. Some people will resect out more than others. Again, this depends on what is the problem, but we don't do a complete temporal lobe resection. There is no such thing.

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SELIM BENBADIS MD: This is a good one for you. How close does the temporal resection go toward the brain stem?

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FERNANDO VALE MD: Well, we're next to it. For those of you that want to know the anatomy, that's the thalamus right here that I'm looking at it, so we're real close to it. You see that white structure? That's the thalamus. If you ever have a human atlas and you want to look at the brain atlas, you'll get a good idea of where we are. Again, you can see the choroid plexus right here. That is a way to get oriented. It tells you where you are.

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SELIM BENBADIS MD: Someone is asking about the cure rate and mentions that she has heard 1/3 after surgery have no more seizures, 1/3 have some, and 1/3 have no change. That's easy to answer because it depends. It depends on the type of surgery and it depends on what we have identified before the surgery, with all the testing I mentioned earlier. That is the reason for doing the testing. Once you do EEG video monitoring, MRI, and other tests, you really have a pretty good idea what the chances are for this particular patient and that is why when medications don't work, we recommend an evaluation. We don't recommend you jump from home and go to the operating room. We recommend the evaluation to determine how good the odds look in your particular situation.

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FERNANDO VALE MD: Absolutely. Everybody's different and that's something that everybody has to understand. We have to get information so we can clarify the seizure type and what kind of options patients have.

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SELIM BENBADIS MD: One of our former patients is asking is this the same surgery Dr. Vale performed on me? Since I know who the patient is, I know that the answer is yes.

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Can epilepsy appear in a young man 30 years old without any problems or prodrome before? Absolutely yes. In fact, temporal lobe epilepsy is the most common adult onset epilepsy, although it does begin in early childhood as well, but it's very common for localized epilepsies to begin in adults, rather than children.

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Dr. Vale, are we missing something important?

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FERNANDO VALE MD: We're just working on the tail of the hippocampus right now, just taking out a little more of that, just to basically change and wrap around the resection.

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SELIM BENBADIS MD: Somebody is asking "this is such an easy question, I can't resist" can you do this surgery for temporal sclerosis? This is temporal sclerosis.

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FERNANDO VALE MD: That's right, but you've got to tell them that this is not something we see from a distance. This is a pathological diagnosis. We know this based on radiographs, EEG, and the clinical picture.

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SELIM BENBADIS MD: This is a very good point, Dr. Vale, and I want to re-emphasize that. When we showed the MRI here and we showed that it shows an area of scar tissue in patients who have mesial temporal sclerosis, I want to caution the audience about something important. Most people with epilepsy and most people with

epilepsy who have surgery have normal MRIs. It's only when we do specific MRIs looking in a specific direction and a specific location that we identify that, so don't be surprised if you have seizures and your MRI is normal. This is the most common scenario.

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What kind of seizures are generated in the temporal lobe? Well, perhaps we should have shown a video, but there are what we call partial seizures. These seizures, like in the patient today, are typically characterized by a loss of contact with the environment, loss of awareness, unresponsiveness, staring, and some unusual movements that we call automatisms. Those usually involve the hands, the fingers, picking, fidgeting, and also the mouth in the form of lip smacking, chewing, drooling, that sort of thing.

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Are surgeons in the UK more reluctant to carry out the operation? I do not know the answer to that. Epilepsy surgery is performed at every major epilepsy center, but it does require, like I said earlier, a multidisciplinary approach, a group of people specially trained, and preferably a surgeon who has specific expertise and training in this.

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Are you taking more of the tail?

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FERNANDO VALE MD: That's right. We're just working on that little tail in there, so we basically make sure that there's not going to be any more activity or electrical activity left behind. That's the idea. The more that we take of the problem, the better chances that this patient is going to be controlled. That's the idea. If this is abnormal, then let's go ahead and disconnect it, remove it, or whatever it takes to make sure it's not going to cause problems for the future.

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SELIM BENBADIS MD: A couple of other easy ones. Can this surgery affect motor skills? The answer is no because the temporal lobe and the anterior temporal lobe, where Dr. Vale is right now, is far away from the motor strip. Again, when the surgery is on the frontal lobe or in the area of the motor cortex, then there are additional steps in terms of mapping, identifying where the problem is with respect to the motor cortex so that it is not affected.

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Dr. Vale, how much blood loss?

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FERNANDO VALE MD: This one? These usually are not going to be much. We've never, never given a blood transfusion to anybody. I would say the likelihood of that happening is extremely, extremely low.

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SELIM BENBADIS MD: This is a funny question here. I think you'll like it. Will the hippocampus ever grow back?

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FERNANDO VALE MD: That's a question for you.

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SELIM BENBADIS MD: It is? Okay. No. That's normal brain tissue, or sclerotic, scarred brain tissue. It doesn't grow back. It's tumors that tend to grow back. This is not a tumor type of abnormality, so no, it does not grow back.

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I had another one that was interesting here. Are there any other effects of the surgery and what are other examples of epilepsy surgery? Again, ill effects, the risks are different for different types of surgery. For temporal lobectomies, the risks are the lowest and the success is the highest. Potential deficits depend on where in the brain the resection is occurring. Now, other types of epilepsy surgery, this type is a cortical resection. That means we remove part of the cortex. Within cortical resection, this is a temporal lobe resection. The other types are a corpus callosotomy, which is sectioning the part that connects the two hemispheres. That's mostly done in children. We do a few, but not too many. It's a different scenario altogether. The objective is different altogether. Usually it does not result in the seizures being eliminated, but it results in an improvement in the seizures, particularly dropping seizures. The other one, which has been featured on TV before, is a hemispherectomy,

where most of one hemisphere is disconnected. That's for very severe, again usually young children, seizures coming from one side.

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There's another question. How do you determine if the seizures are coming from the left versus the right?

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FERNANDO VALE MD: That's an excellent question.

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SELIM BENBADIS MD: We determine that by the evaluation I described earlier, the two most important pieces of which are prolonged EEG video monitoring and imaging, which includes MRI and nuclear imaging techniques. I also want to make a comment about EEG video monitoring. A lot of centers can and do perform EEG video monitoring. That doesn't mean they evaluate patients for surgery. There's a difference between epilepsy centers. In fact, there are different levels of epilepsy centers, according to the National Association of Epilepsy Centers. Level 1, 2, and 3 can do evaluations for diagnosis, so you can perform EEG video monitoring and determine what is seizures and what is not, but when the purpose is for resection or epilepsy surgery, it should and is always performed and only performed at level 4 centers, such as ours. Again, as I mentioned earlier, most large academic university-based centers in the U.S. have an epilepsy center that performs surgery. Dr. Vale, give us an update while I look at more questions.

00:39:40.000

FERNANDO VALE MD: We're almost done, in a sense. I'm removing one of the retractors, just basically to look at the resection. These are little things that we put in there, called gelfoam, just to separate the tissue and at the same time achieve hemostasis. We're in the back of the brain stem right now and basically what I'm doing is just keeping everything clean, trying to maintain a plane between what is normal and abnormal. Right now, this is the final stages of the operation. We're just basically taking care of the little details.

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SELIM BENBADIS MD: Somebody wants to know what the dark or black tissue that you're removing is.

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FERNANDO VALE MD: This is basically areas of where the blood vessel potentially can bleed, so we establish what we call hemostasis to basically prevent it from causing any problems in the future.

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SELIM BENBADIS MD: Excellent. I have one that says how long is the recovery process in patients? Dr. Vale, if I'm not mistaken, it's usually 3 days or so.

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FERNANDO VALE MD: Usually I keep them at least 48 hours in the hospital, which 24 hours are going to be spent in the intensive care unit. If the patient is doing well after 48 hours, they can potentially go home. Now, I would say most of the patients may like to spend another day in the hospital, but usually it doesn't mean more than 72 hours.

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SELIM BENBADIS MD: We have had patients leave as early as 24 hours, straight out of the intensive care unit. That's a little unusual. On the other hand, you also have people sticking around a little longer because of discomfort and the little headaches that you get after surgery.

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Interesting question: My son had a grand mal seizure when he was 18 months due to a high fever. Is it possible that he will have more seizures? It is possible, but remember, febrile seizures ñ that's what your son had ñ are usually benign. They're very common in kids before the age of 3 and the vast majority of them are benign and do not cause later epilepsy, especially if it was an isolated single seizure and it has not repeated itself.

00:42:09.000

I have an email for you from one of our former patients, who said that when you discharged him in 2004, you said he could now go bungee jumping and skydiving, and he wants to go with you.

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FERNANDO VALE MD: Well, one of these days. I'm not sure. I'm kind of scared about that skydiving business, but we'll work on it.
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SELIM BENBADIS MD: Okay. Maybe I'll take your place.
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This is from somebody I know also. How do you know you've taken the entire area out and what precautions are taken when the resection is done?

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FERNANDO VALE MD: Well, based on the workup that had been done before surgery, we know where the problem is. This is something that a lot of experience, and we're talking about experiences more than 50 years of doing temporal lobe surgery in the medical community, we have learned to appreciate the area of the problem. Basically we focus ourselves on learning from previous experience. We know, and we're right about 80% of the time, that removing this part is good enough to control the epilepsy.

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SELIM BENBADIS MD: What type of follow-up is done for surgery? A related one: What type of testing after surgery? Usually the whole focus of doing this is to free you of testing and doctors, so we don't see people too often. We see them at 1 month, then 3 and 6 months. For the 80% that become seizure-free and do well, we happily say goodbye eventually. We usually refer them back to their referring neurologist. Like we said earlier, the tapering of the medications can take a year or two and go slowly and carefully. We're always available to the community of neurologists, but we try to return patients back to them for the rest of the medical management. Dr. Vale will usually do an MRI to verify the extent of the resection at, I don't know, 3 months, 6 months?

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FERNANDO VALE MD: 3 months.

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SELIM BENBADIS MD: Then we follow the patients and keep track of the seizures. Like I said, the purpose is that you see less and less of us afterwards.

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Here's an interesting one. This is kind of funny too. Are neuropsychological tests reliable for localizing epilepsy? I assume the person means for localizing where the seizures are coming from?

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FERNANDO VALE MD: I'll leave that one to you.

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SELIM BENBADIS MD: Yeah, thank you. The main purpose of neuropsychological testing is to assess the patient's ability before surgery and to have something to compare to post-surgery. At best, the neuropsychological testing can vaguely tell us if there is dysfunction on the left or on the right or maybe bilobed, if it looks more frontal or temporal or none of the above, but it's not a strong localizing test. As I mentioned earlier, the tests that are critical for localization are EEG video monitoring and neuro imaging, which includes MRI and nuclear scans. Nonetheless, neuropsychological testing is routine as part of the presurgical evaluation that's done at every center.

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FERNANDO VALE MD: For those of you who are wondering what I'm doing right now, this is Surgicel. It's a substance that we put on the surface of the brain to allow for hemostasis. Again, it's all about keeping it the way that it is so when the patient wakes up, they're doing real well and can go home early. That's what we're doing because basically the resection has been done. That's the cavity on the left. That's on the anterior temporal region. Anterior is on the front. We have some structures there, big arteries. That's an artery right there. Like I said before, that's the brain stem. We want to preserve those and stay away from them. It looks well preserved. Everything looks the way that it should be, so I'm really happy with this operation.

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SELIM BENBADIS MD: If you go back to the PowerPoint slide, the MRI of this patient will likely look just about like this, where you see the hippocampus missing. The image I'm showing is on the right side and of course this one is occurring on the left, but other than that, it will be very similar.

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Could scarring from a stroke cause epilepsy later in life? Very much so. In fact, stroke is the most common cause of epilepsy after the age of 60-ish, so this does happen quite commonly. By the way, when you have localized seizures, surgery can be helpful almost regardless of the cause, whether it's scarring, which is by far the most common, at least in adults, or a small malformation, microscopic malformation from birth, trauma, or infection. We have several patients that are seizure-free now after, for example, a traumatic epilepsy that has affected the frontal lobe.

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How can I get a copy of the article? We'll take care of that. A lot of these emails are just going to be forwarded to me later on through the center and we'll take care of them. Let's see the closing phase. Are you in the closing phase?

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FERNANDO VALE MD: I am. We're going to get along soon. Now we're going to change, for those of you that want to know, that's the other side right there. It's next to the membrane, what we call the dura of the brain. That's a little vein there, attached to the surface of the brain. We're just inspecting everything, making sure everything is okay before we close.

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SELIM BENBADIS MD: I would love to say the name of some of these people that are sending these emails because I know who they are, but anyway, I will give you one, Dr. Vale. I had my surgery October 2003. My life has not been the same. I'm a new person. Thank you.

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What are the most common techniques to close the skull?

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FERNANDO VALE MD: Well, hopefully we'll have enough time to look at this. We're going to put that membrane that covers the brain first, then we're going to put a little plate to hold the bones together.

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SELIM BENBADIS MD: I hope we get to look at that. People often ask about that and shaving the head. Do you want to emphasize that?

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FERNANDO VALE MD: Oh, no, no, we don't like that. Nobody likes that anymore. We try to keep the haircut to a minimum. I failed barber school a long time ago, so I gave up on cutting hair. I try to preserve as much as I can.

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SELIM BENBADIS MD: Very good. This is very commonly asked, as you can imagine. Does the hippocampus appear white because of the epilepsy or is that its normal color?

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FERNANDO VALE MD: White because it's fibrous. The brain is made up of brain cells that usually give a gray color and the connections, that is the telephone cables, are usually white in color because of the way that they're made. So the hippocampus has a layer of connecting tissue, or let's say connecting fibers, on top of it, and that's the reason it looks so bright under the microscope.

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SELIM BENBADIS MD: Is there no possibility of damage to the brain stem or the thalamus?

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FERNANDO VALE MD: Any surgery in the brain has a possibility of causing problems. I mean, those are what we call complications. That's the reason that we recommend this surgery be performed by somebody that knows and has plenty of experience about these kinds of procedures, because of the close proximity to such vital structures.

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SELIM BENBADIS MD: Why is there such a delay for people to have epilepsy surgery? We often wonder that. What is why we do a lot of educational conferences and try to educate our colleagues, but I really think it's not in the culture yet and a lot of physicians, even, and the lay public is under the impression that epilepsy surgery is highly risky and should be saved only for a last resort. As I mentioned earlier, currently the delay for this is still very, very long and people wait too long to be referred for epilepsy surgery, on average greater than 15 years.

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FERNANDO VALE MD: What I'm doing right now, I'm sorry to interrupt you, but I irrigated the brain because we have brain fluid and some of that brain fluid has been removed, so I try to kind of replace it right now. At the same time, it allows me to know what's going on. As far as I can tell, there is no bleeding and everything looks the way it should be. I'm just trying to replace the brain fluid with what we call saline.

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SELIM BENBADIS MD: Somebody is asking about the titanium plate. Do you use that?

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FERNANDO VALE MD: That's what we use to put the bones together. Hopefully we'll get there. I don't know how much time we have. Probably we can start working on that in the next 5-10 minutes, doing the closing phase.

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SELIM BENBADIS MD: How long, exactly, is the surgery from incision to closure?

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FERNANDO VALE MD: Usually about 3-4 hours, depending on the situation. Sometimes the patient here for a little bit longer, usually because our friend from anesthesia has to put their lines and do their usual maneuvers for the safety of the patient. Those may take another hour, so you add everything together, you could say 4-5 hours, but in reality, the actual surgery is probably 3-4 hours.

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SELIM BENBADIS MD: I have a great question for you here and I am not making this up. What was that thing you removed from the brain?

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FERNANDO VALE MD: What was that thing I removed from the brain? As far as I know, we took out the hippocampus. That's the area that was causing the seizures. I removed a couple of other things which are basically devices that we use to achieve hemostasis. I removed a piece of gelfoam, as I explained before, that I put right at the beginning of surgery to separate what is normal from what is abnormal. I'm real happy with what I see right now. In this situation, we basically will proceed with the closure, as long as there are no other questions regarding the resection.

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SELIM BENBADIS MD: This is one only for Dr. Vale. The brain seems to be extremely sensitive. What type of instruments are used to avoid any damage?

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FERNANDO VALE MD: Well, that's a good observation. The brain is sensitive, so that's the reason I'm so careful. You can see I use little pieces of cotton to protect the brain and that's what gelfoam is, kind of modified cotton so I don't touch it or cause any damage to the surrounding brain. Then I use this instrument to suction, that's on my left, right here, that I'm moving right now. This is just to basically remove brain fluid. This instrument right here is what we call a bipolar. It's a real nice instrument that allows you to basically remove what the tips are touching and nothing else, so it's something that helps in neurosurgery and that's how we remove only this part of the brain. There are some more instruments that you can use, but these are the ones I prefer for this kind of operation.

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SELIM BENBADIS MD: I think we want to see the closing when you get there.

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FERNANDO VALE MD: That's where we're heading right now.

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SELIM BENBADIS MD: Thereís a lot of questions about the closing, the sort of stitches you use, plates.

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FERNANDO VALE MD: Right now what we're doing is just trying to reapproximate what we call the dura. The dura is the layer of thick connective tissue that protects the brain. You can see as we do a few things right here, I'm going to show you the bone and where we are. We use this suture material to basically reapproximate the dura that is the covering of the brain.

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SELIM BENBADIS MD: Does the bone heal?

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FERNANDO VALE MD: The bone? That depends on the age of the patient. Younger patients will usually create new bone or basically will get a calcification of the area. Older patients, like me, probably won't have bone growing back in, but younger patients will get some bone growing back in.

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SELIM BENBADIS MD: I'm glad you mentioned older like you because it gives me a chance to notify everybody who doesn't know that today happens to be Dr. Vale's birthday.

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FERNANDO VALE MD: I was trying to keep that as a secret.

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SELIM BENBADIS MD: Nice try. This is a good question. How many Level 4 epilepsy centers are there in the U.S. and where are they? Wow, great question. There are many. As I said, most large cities that have a university medical center or a medical school have a large neurology department and most neurology departments have an epilepsy program or an epilepsy center. There are different ways to go about this. You can go to the American Epilepsy Society website, which is, I believe, www.aesnet.org, but you can look that up. The other one is the National Association of Epilepsy Centers, and I do not know the URL by heart, but it's the National Association of Epilepsy Centers. A word of caution that not every center that does epilepsy monitoring is a surgical center.

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FERNANDO VALE MD: Thereís a question for me. How do you make sure that the center you're going is a level to take care of your problem?

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SELIM BENBADIS MD: That's why the National Association of Epilepsy Centers has a designation of Level 1, 2, 3, 4. The 4th level are considered surgical epilepsy centers. Like everything else, you investigate. How many do they do, what kind of training do the physicians have, and so forth? Again, many centers, many hospitals will do EEG video for the purpose of diagnosis, but it is quite different from doing epilepsy surgery.

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This is a good question. Is there some trial for success ability, that means success, if the operation is done earlier or later? As you know, Dr. Vale, there is such a trial. It's called the Erset trial and it was headed by one of the leading epileptologists, who is out at UCLA. It's been very difficult for the trial to recruit patients, as you can easily imagine, because the trial wants to see what happens when we do epilepsy surgery early, within 2-3 years of seizure onset, and the reality right now is that patients with difficult epilepsy are not referred until much later than that, so it's been very difficult to recruit patients.

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I have another email from one of our former patients. "I had my surgery in 2001. I can tell you the physicians I went to before that were not very well informed about the procedure." Thereís a bunch of other things, but the conclusion is, "Thank you all for giving me my life back. You really do change people's lives when you rid them of their seizures." I think we both hear that quite often.

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Dr. Vale, how is the closing?

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FERNANDO VALE MD: It's going as expected. We're basically reapproximating the layer of tissue called the dura, which protects the brain. This is the first stage in the closing procedure and it's coming along the way it should be.

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SELIM BENBADIS MD: Okay, I think it is 5:00. Sadly, we do have to end this broadcast. I want to thank everybody who attended. I want to again thank everybody we work with. It's a team effort. All the neurologists, neuroradiologists, Dr. Vale of course, our nurse coordinator, all the nurses and EEG technologists and neuropsychologists. I think with that we're going to say thank you and hopefully everybody learned quite a few things, and we will be happy to answer all the other emails that I wasn't able to address. Thank you so much.
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FERNANDO VALE MD: I'd like to say thank you also to our helpers, Adam today, and Margaret, and residents team, as well as Dr. Badge. Thank you.

00:59:54.000

NARRATOR: This has been a live webcast of a temporal lobe resection from Tampa General Hospital in Tampa, Florida. For more information, to make a referral, or make an appointment, click the buttons below.