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Evaluating Eloquent Brain Tumors: Diagnosis & Treatment

Announcer:
You're listening to ReachMD, and this is Advanced Treatments and Innovations from Mayo Clinic. Here's your host, Dr. Jennifer Caudle.

Dr. Caudle:
According to the National Brain Tumor Society, as of 2020, an estimated 700,000 Americans are living with a tumor in the central nervous system, 85% of which are located in the brain. While about 70% of these tumors are benign, they can be in any area of the brain, regardless of function, causing significant tumor-related morbidity to patients. And tumors located in eloquent areas of the brain present their own unique set of challenges for physicians. So, how can we overcome these barriers?

Welcome to Advanced Treatments and Innovations from Mayo Clinic on ReachMD. I'm your host, Dr. Jennifer Caudle, and joining us today is Dr. Alfredo Quinones-Hinojosa and Dr. Wendy J. Sherman. Dr. Quinones-Hinojosa is a consultant and serves as chair of the Department of Neurologic Surgery at Mayo Clinic's campus in Florida. Dr. Quinones-Hinojosa, thank you so much for joining us.

Dr. Quinones-Hinojosa:
Thank you for having me, Dr. Caudle.

Dr. Caudle:
And Dr. Sherman is a board-certified neurooncologist, with a special interest in primary and secondary brain tumors. Dr. Sherman, welcome to the program.

Dr. Sherman:
Good morning. Thanks for having us on this.

Dr. Caudle:
Starting with you, Dr. Sherman, what's considered an eloquent area of the brain? And if the brain as a whole is considered eloquent, which areas are considered to be the most eloquent?

Dr. Sherman:
That's a really good question. The term "eloquent" was adopted, really by neurosurgeons, really to indicate the parts of the brain that are directly involved in neurologic function, that are critical to that function – where, if we were to cause injury in those areas, patients could have very disabling neurologic deficits. And so these are considered essential for very basic neurologic functions. Other parts of the brain – the non-eloquent parts of the brain, as we now refer to it – used to be referred to as "silent." We know the other parts of the brain are not silent, so now we refer to them as non-eloquent, really indicating that they have more subtle function, and perhaps function that may be duplicated in other areas, so injury to those areas would not be necessarily as dramatic-appearing as if it were to occur in eloquent areas. So, typically when we think about eloquent areas, we think about the sensory-motor cortex, the language cortex, visual cortex, you know, thalamus with our sensory function, and our motor function with the internal capsule and basal ganglia. Those are the main areas that we think of as eloquent areas.

Dr. Caudle:
Sticking with you for another moment, Dr. Sherman, can you tell us how you diagnose an eloquent brain tumor?

Dr. Sherman:
So typically, when patients have a tumor in an eloquent area, they usually present typically acutely. They can present to the emergency

room, though they're also sometimes seen as an outpatient, but if they do present to the emergency room, they would first have a head CT, which would likely show the mass. You know, that would be followed up with an MRI of the brain, with and without the contrast dye that would better demonstrate the mass, the structural location, and the characteristics of the mass, to give us an idea of what type of tumor it might be. And then, beyond there, there's more testing that can be done to give us a better indication of how involved that mass is with an eloquent area, and Dr. Quinones, if you want to speak more in that regard, in terms of some of the preoperative evaluation that's done to diagnose this.

Dr. Quinones-Hinojosa:
Well, thank you Dr. Sherman. Indeed, they should do a functional MRI, of course. We have our multi-disciplinary team of neuropsychologists that help us understand how this potential tumor is having an effect on those eloquent and subtle functions that Dr. Sherman was alluding to. So we do not only functional, in regards to language, understanding of language, production of language, vision, memory, but also we look at the deep white matter connections that allow those areas of the brain to function as a unit. So, in essence, we try to understand, "How is this tumor affecting the quality of life of our patient, in addition to the language or the motor function?" And we are beginning to understand how will we go into the operating room to disconnect those areas, take a tumor out, and ideally leave the patient intact.

Dr. Caudle:
Turning to you, Dr. Quinones-Hinojosa, how is the surgery for resection of eloquent brain tumors carried out?

Dr. Quinones-Hinojosa:
This is an amazing question that I get so excited just to be asked about it because I favor into what Dr. Sherman just mentioned. First of all, we make sure that we understand, how is this tumor affecting the patient? And if the effect is in language, you know, vision, motor function, in general, we try to make sure that we understand the ability of the patient to go into the operating room to have potentially a surgery when the patient is awake. So, if we know that the tumor is affecting language or is near a part of the brain that is important for language, or motor function, or vision, we can potentially map those functions in the operating room, confirm what we saw in functionalized MRIs, or in neuropsychology, and then be able to go into the operating room and disconnect. But that can only happen, I tell you when you have an amazing multidisciplinary team. So first, you have to have extraordinary, gifted, neuroanesthesiologists, which is something, of course, that we are so blessed to be able to have at the Mayo Clinic. And then the neuropsychology team, then the nursing team, the technicians team, the imaging team, the neuroradiology team, and of course, in the middle of this team is us as neurosurgeons. And we all work as an orchestra in the operating room, as a symphony to be able to find the voice, find the function, find whatever we are looking for in the operating room, and try to make sure that we disconnect those areas and get these tumors out.

Dr. Caudle:
And just as a quick follow-up to that, Dr. Quinones-Hinojosa, how feasible is the surgical removal of brain tumors located in eloquent areas, such as speech?

Dr. Quinones-Hinojosa:
I always tell patients, every tumor can have surgery. The question is what is the potential collateral damage? We do know, based on some of the studies that we have done at the Mayo Clinic, that if sometimes we create an irreversible damage, as Dr. Sherman earlier said, to these areas, it can potentially work against us. So it's a fine balance, I always tell patients. The question is how much can we take out? Can we take it all out? Everything that we can see on the MRI? And you would be surprised – in my own experience, in my own series, doing this type of surgeries, I can take them out with a very good what is called "gross total resection," anywhere between 80-90% of the time. That means that in about 10% of the cases, I have to leave a little bit of tumor behind.

Dr. Caudle:
For those of you who are just joining us, this is Advanced Treatments and Innovations from Mayo Clinic on ReachMD. I'm your host, Dr. Jennifer Caudle, and today I'm speaking with Dr. Alfredo Quinones-Hinojosa and Dr. Wendy J. Sherman about identifying and treating brain tumors in eloquent areas. Now, Dr. Quinones-Hinojosa, if we turn our attention to brain mapping, can you tell us what this is and how you do it?

Dr. Quinones-Hinojosa:
Thank you very much, Dr. Caudle. This is a very, very dear question to me because I have dedicated my life with our team, to not only being able to do this but to put a team that can actually accomplish this. If you go into the operating room, and you see us doing a surgery for a patient where the tumor is near the language, whether it is reception of language or production of language, you'll see that we have a team in which we coordinate efforts to make sure that the patient is, number one, comfortable and under the least amount of stress. Of course, no one is going to be 100% stress-free when someone is opening their brain, but we try to make sure that the neuroanesthesiologists work with them, make them comfortable. We go into the operating room, the neuropsychologist is there with us

– all the multidisciplinary teams, from imaging to technicians that allow us to use the state-of-the-art technology, and of course, electrophysiology because when we are stimulating the brain, we gotta make sure that we are at the same time collecting electrophysiology information to make sure that the patient is not having a seizure. So, when we normally do in the operating room — language, motor mapping, vision, memory — all these steps are being done and you'll be surprised, these surgeries move quite expeditiously. That means that I can take a tumor within an hour, sometimes, and the patient, of course, is the number one unsung hero, because I always tell the patients, "I cannot do this without you." They have to be able to move their arms if the tumor is in the motor area. They have to be able to talk about their memories if the tumor is in the temporal dominant area. They have to be able to see, to produce language, to understand language, to read, to listen to music – sometimes we have them playing the guitar in the operating room, or the piano, and so many of these eloquent parts of the brain. But that's how we get it done, and that's how we have moved the field forward.

Dr. Caudle:
And turning to you, Dr. Sherman, what exactly does this brain-mapping technology mean for our patients?

Dr. Sherman:
This has been absolutely amazing for our patients. This has given our patients a fighting chance at what is a really tough disease to fight against. I mean, before this mapping technology, when patients would have a tumor in an eloquent area, they would likely only get a biopsy. And we know that patients live shorter, and the tumor comes back much faster after chemo and radiation – for our glioma patients, especially – when we can't get a significant portion of that tumor out. And like Dr. Quinones said, he gets gross total resections often. Those patients live significantly longer, tolerate treatment much better, and it really just gives them a chance to fight against this. And I think the other piece of it too is with this mapping, patients' quality of life is so important. If we can't cure this disease it's so important to give them a good quality of life. And that means being able to take part in their family functions, to be active as they could be in comparison to before their tumor diagnosis, and doing this mapping really allows them to have as good of a quality of life as possible, as they fight this disease.

Dr. Caudle:
Before we wrap up, I'd like to turn to both of you now and ask you each to share some key takeaways from our discussion today. Dr. Sherman, let's hear from you first.

Dr. Sherman:
I guess my key takeaway would be, because this is so important to get as much of the tumor out as possible and to retain a patient's function, I think that these tumors really should be seen in highly specialized centers, like Dr. Quinones said, where there's this multidisciplinary team that can do the preoperative evaluation, that can do the mapping to give these patients the best chance at fighting this disease. I think that's just so important, to make sure that they get that chance.

Dr. Caudle:
And Dr. Quinones-Hinojosa, what would you like to leave our audience with?

Dr. Quinones-Hinojosa:
I would like to make sure that the audience who is fighting a lot of people who hear this because they themselves or their loved ones are fighting the fight of their lives against these tumors – I want them to know that there are people like Dr. Sherman and myself, and many of our team members, who care for them, and we are fighting every day to find a cure. And we know that the hope is the only emotion that is stronger than fear. And don't lose hope – look us up here at the Mayo Clinic for our multidisciplinary care, and we'll be delighted to help care for you or your loved ones.

Dr. Caudle:
Well, with those key takeaways in mind, I'd like to thank my guests, Dr. Alfredo Quinones-Hinojosa and Dr. Wendy J. Sherman, for joining me to discuss brain tumors in eloquent areas. It was great having you both on the program.

Dr. Quinones-Hinojosa:
Thank you so much, Dr. Caudle. What a great honor for us to be here with you today.

Dr. Sherman:
Thank you so much, it's really been a pleasure.

Announcer:
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