Transcript Details
This is a transcript of an educational program. Details about the program and additional media formats for the program are accessible by visiting: https://reachmd.com/programs/medical-breakthroughs-from-penn-medicine/the-future-of-deep-brain-stimulation-for-parkinsons-patients-and-beyond/7204/

ReachMD
www.reachmd.com
info@reachmd.com
(866) 423-7849

The Future of Deep Brain Stimulation for Parkinson's Patients and Beyond

ReachMD:
Welcome to Medical Breakthroughs from Penn Medicine, advancing medicine through precision diagnostics and novel therapy. Your host is Dr. Lee Freedman.

Dr. Lee Freedman:
The therapeutic options for Parkinson's disease have expanded greatly in the past decade. What is the current status and future of deep brain stimulation for Parkinson's patients and beyond? I'm your host, Dr. Lee Freedman, and with me today is Dr. Gordon Baltuch, Director of the Center for Functional and Restorative Neurosurgery, and Professor of Neurosurgery at the Pennsylvania Hospital. Dr. Baltuch, welcome to the program.

Dr. Gordon Baltuch:
Thank you very much, Dr. Freedman, for having me on today.

Dr. Lee Freedman:
Well it is our pleasure, and I am very excited to hear about this topic. Perhaps we could start at a very basic level, and could you describe for us the technique of deep brain stimulation. How is this done?

Dr. Gordon Baltuch:
Absolutely. Well, deep brain stimulation uses fairly basic technology, and we place two insulated wires into deep structures in the brain and connect those wires up to a base pacemaker which sits below the collar bone. And we basically put electricity into people's brains and modulate their circuitry in order to sort of impact on their motor symptoms of Parkinson's disease.

Dr. Lee Freedman:
That's very interesting. It's almost like a pacemaker for the heart except for certain structures in the brain.

Dr. Gordon Baltuch:
Absolutely. It's a brain pacemaker.

Dr. Lee Freedman:
And I imagine in putting the wires in, you go through parts of the brain that are not critical?

Dr. Gordon Baltuch:
Well, I think all parts of the brain are critical. I think what we have to do is we have to place, as we go through those parts of the brain we have to be very, very careful to try to cause the least amount of perturbation to those parts of the brain as we pass. And we use very, very thin wires.

Dr. Lee Freedman:
So there isn't a lot of morbidity that results from placing the instrument?

Dr. Gordon Baltuch:
I mean, it's always brain surgery and there's always morbidity involved, but we try to keep that morbidity to a minimum. These are very small incisions over the scalp, and really only sort of dime size holes in the skull.

Dr. Lee Freedman:

Very interesting. And then specifically for Parkinson's disease, what are the indications to go to deep brain stimulation in this disorder?

Dr. Gordon Baltuch:
Well, these are patients who have had advanced Parkinson's disease. These are patients who in spite of the best medical therapy at the moment, are starting to experience sort of issues with the medical therapy, what we call fluctuation, in which they will go on a roller coaster of sort of on with complications of that on state, what we call dyskinesia is abnormal movements, to an off state in which they're often rigid, slow, sometimes have tremors, sometimes have freezing of their gait.

And they do this unpredictably in spite of these medical therapy. So these really are good candidates. They're patients who are sort of going on this up and down scale who actually look very good and have good motor function in their best on state, but then are taking a lot of meds to get to it, and it's sort of unpredictable how long they'll stay in that state.

Dr. Lee Freedman:
So this is something that comes up a little further in the course of Parkinson's after someone has had it for a while and maybe as you say, failing on some of the medication.

Dr. Gordon Baltuch:
Absolutely. A recent study has suggested that patients with early onset Parkinson's disease and new fluctuations could benefit from deep brain stimulation. But what we mean by early is someone who's had Parkinson's disease for at least seven to ten years. That's sort of an early, as opposed to a chronic Parkinson's disease would be probably 10 to 20 years. Those are the types of patients that we are usually looking at in terms of the amount of time they've had this disease.

Dr. Lee Freedman:
And are there particular elements of Parkinson's disease that deep brain stimulation is best for, and other things that it doesn't help quite as much?

Dr. Gordon Baltuch:
Yeah. Parkinson's disease has different types of symptoms. It has motor and non motor symptoms. This therapy is really good for the motor symptoms of Parkinson's disease, such as the slowness, the stiffness, tremor, difficulty walking. The symptoms that are often responsive to medication are also the ones that respond well to deep brain stimulation. The symptoms that unfortunately deep brain stimulation does not help are the non motor symptoms, such as the cognitive decline, some of the mood disorders. The autonomic dysfunction of Parkinson's disease it does not help.

As well, deep brain stimulation is disease modifying. It's a treatment for Parkinson's disease, it is not a cure. And unfortunately although it helps the motor symptoms, the disease does progress with time.

Dr. Lee Freedman:
Absolutely. And so some of those very disabling parts, the dementia or cognitive, the depression and all, not quite as much. Really this is more to help with the motor symptoms as you outlined.

Dr. Gordon Baltuch:
Absolutely. The cognition remains a huge challenge in this disease state, and a challenge for research in the future.

Dr. Lee Freedman:
What is the interplay between the medications and deep brain stimulation? Once this is put in, are patients typically pulled off of some of their medicines, or they're used in conjunction with each other?

Dr. Gordon Baltuch:
Yes and no. I like to look at deep brain stimulation as sort of an electrical medicine of the brain, and it's used in combination with medications. So some patients will be able to decrease their medication. In some patients the deep brain stimulation will be a supplement for the medication that they're taking already. So there is a fine interplay between the two. This is something that the movement neurologists have a lot of expertise in, in programming these stimulators and adjusting the medications at the same time. It can actually be quite intricate.

Dr. Lee Freedman:
And in terms of programming, are there a variety of ways to have these impulses affect, I guess the caudate and the other structures?

Dr. Gordon Baltuch:
Absolutely. And programming the stimulators is both a science and a true art form which actually is developing year to year as people come up with novel ways of programming these stimulators.

Dr. Lee Freedman:
And at this point are there newer technologies with programming or other aspects of deep brain stimulation that you are working with at Penn?

Dr. Gordon Baltuch:
Yes, well some of the things that we've been working with recently and has been rechargeable technology. For the most part there've been now over a hundred thousand deep brain stimulator systems placed world wide. For the most part the stimulators last between three and five years. More recently the industry has developed rechargeable technology which now allows patients to have nine years of battery life, which is excellent, because before the people had to come in every couple of years to get their pacemaker changed. Now they can go a full nine years without getting another operation.

This involves charging your batter like you charge a cell phone, but only really needs to be done once a week. So this is really, really exciting, especially for a young person, you know, someone who may be in their let's say early 50s with young onset Parkinson's disease, who is looking at numerous battery changes over their life span. This could really be excellent, excellent in terms of therapy for them.

Dr. Lee Freedman:
Really improved quality of life and it's a nice long period of time not to have to have another procedure.

Dr. Gordon Baltuch:
Absolutely. We're also looking at sort of some new indications for deep brain stimulation. These are all investigative at the moment and they're not FDA approved, so they're being done under careful research protocols. And some of those indications are epilepsy which is the use of stimulation to try to, although not cure, decrease the frequency of and severity of seizures.

And two other interesting indications that we've looked at over the last couple of years have been depression as well as Alzheimer's disease. In depression, we've been involved in investigations to try to see if we can improve depression in people with sort of treatment resistant depression. And we've also looked at deep brain stimulation for patients with sort of early Alzheimer's disease and sort of early memory loss.

The word is not completely out on these therapies. They are investigative, but it could be very, very interesting in the future.

Dr. Lee Freedman:
If you're just tuning in, you're listening to Medical Breakthroughs from Penn Medicine on ReachMD. I'm your host, Dr. Lee Freedman, and I'm speaking with Dr. Gordon Baltuch, Professor of Neurosurgery at the University of Pennsylvania. Dr. Baltuch, in terms of side effects, are there any things we need to watch for with the procedure itself or placing the deep brain stimulator, and subsequently while people are being treated with this?

Dr. Gordon Baltuch:
Absolutely. We have to do these procedures very, very carefully. You know, these structures are small, they're the size of Rice Krispies deep in the brain. It's important that we take the utmost care to place these stimulators as accurately as possible. There is definitely the potential for serious morbidity in these cases, which we try to maintain to a very, very low percentage. As well because these are devices and they're foreign to the body, they run the risk of becoming infected and it's very important that we do our utmost to reduce any chance of infection in these patients and in these devices.

As well over time as people advance in their Parkinson's disease, these devices can potentially erode as the skin becomes thin. So we have to be on the lookout for all those things.

Programming these devices themselves requires a lot of skill, and over programming or turning the voltages or currents too high can potentially cause untoward potential motor defect, and sometimes untoward mood effects. So it takes a lot of expertise and really a multidisciplinary team including neurologists, neurosurgeons, and sometimes neurophysiologists to do this type of work properly.

Dr. Lee Freedman:
And Dr. Baltuch, are there particular patients with Parkinson's disease who you would say these are not good candidates for this type of therapy?

Dr. Gordon Baltuch:
Yeah, absolutely. And it's unfortunate because we wish we could help sort of everybody with this technology. But from experience over the years, we've seen that some people just don't do well or don't respond, and those are the people with the very, very advanced Parkinson's disease. Those who are now wheelchair-bound and in spite of any medication, now can no longer walk. Those patients are still unable to walk after an operation. It doesn't get patients who are no longer ambulatory, ambulatory.

And the other group of people unfortunately are those who have had sort of serious cognitive dysfunction and dementia, the operation is not helpful and actually can sometimes make unfortunately the cognition worse. So any patient over a certain age we'll screen very carefully in terms of a neurocognitive assessment to make sure that we aren't operating on patients who have serious cognitive deficits, because really that's the last thing we want to do is make those people worse.

Dr. Lee Freedman:
And in terms of some of the newer indications that you had spoke about, the idea of using this for depression is really intriguing. Do you go to different areas of the brain with the stimulation for this disorder?

Dr. Gordon Baltuch:
We do. There are a few different targets that have been investigated for depression now. One is the ventral striatum around the nucleus accumbens, and one is what we call area 25 in the sub colossial cingulum. They may be connected to the same circuit, and the circuits for depression and their understanding of them is somewhat behind the understanding of the circuits for Parkinson's disease. However, with the greater knowledge of these circuits, we're starting to get a better feel for how deep brain stimulation might work.

In terms of treating Alzheimer's disease, we are looking at the memory circuits surrounding the fornix and seeing if we can apply electrical stimulation to the fornixeal area and sort of increase that level of memory in people who have had some memory loss.

Dr. Lee Freedman:
Very interesting. And are there other particular things as you look to the future, other disorders or other developments in technology that might further the use of deep breast stimulation?

Dr. Gordon Baltuch:
Well, I think the most exciting thing recently has been the Obama brain initiative and the DARPA project, which is looking at creating an implantable device to potentially improve memory in patients who have suffered trauma. And potentially devices that may be able to impact on things like post-traumatic stress disorder. This is sort of very, very futuristic, however the government has committed a significant budget for a group of people including University of Pennsylvania and other institutions to work towards creating really a sort of almost a micro bionic stimulator device which would impact on memory. And I think it's like putting a man on the moon, but it could be really, really exciting.

Dr. Lee Freedman:
That does sound fascinating. And are there advances in basic science in terms of our understanding of the pathways in the brain that will help in terms of treating some of these newer indications?

Dr. Gordon Baltuch:
Absolutely. I mean, there has been work recently on micro stimulation in various regions of the brain, which has demonstrated that some of the patterns that we see in the brain and our ability to impact on them things like learning and memory. And I think the technology and the neuroscience are sort of both developing in parallel, and as they can come together, we may be able to leverage both those findings towards new therapies.

Dr. Lee Freedman:
And would it be fair to say that the take home message, or one of the take home messages for doctors treating Parkinson's patients, is to consider deep breast stimulation, particularly in those with prominent motor symptoms who have the fluctuating type of presentation that you have described.

Dr. Gordon Baltuch:
Absolutely. That is the take home message. And I would say to the treating physicians if you're skeptical about this, I would go to the articles in the New England Journal of Medicine where these sort of randomized class one trials have been published, read the literature and convince yourself. Don't just believe me but go read the literature and see the data for itself which has been published, in which these surgical therapies have been randomized against best medical therapies and showed to be not only much more efficacious, however the safety seems to be better for the surgical arms than the medical arms, i.e., the patients who are getting these medical therapies are also getting adverse effects from the amount of medication that they are taking.

Dr. Lee Freedman:
Well, I very much want to thank Dr. Gordon Baltuch, Professor of Neurosurgery at Pennsylvania Hospital and Director of the Center for Functional and Restorative Neurosurgery, for outlining for us this very exciting therapeutic intervention, deep brain stimulation particularly for Parkinson's disease, but he also touched on some potential use of this technology in other very common and debilitating disorders. Dr. Baltuch, thank you again.

Dr. Gordon Baltuch:
Thank you very much, Dr. Freedman.

ReachMD:
You've been listening to Medical Breakthroughs from Penn Medicine. To download this podcast or to access others in the series, please visit reachmd.com/penn and visit pennphysicianlink, an exclusive program that helps referring physicians connect with Penn. Here you can find education resources, information about our expedited referral process, and communication tools. To learn more, visit www.pennmedicine.org/physicianlink. Thank you for listening.