Podcast Transcript: Deep Brain Stimulation and Movement Disorders
William S. Anderson, M.D., Ph.D

(00:00:00) Respondent: I am William Anderson; I am a Neurosurgeon at Johns Hopkins Hospital.

Interviewer: And I am Elizabeth Tracy. So glad to be with you this morning, we’re going to be talking about a treatment for what?

(00:00:10) Respondent: We’re going to be talking about a treatment for a type of neurological condition known as a movement disorder and probably the most common types that we treat with this surgical treatment include Parkinson’s disease, Essential Tremor and less frequently Dystonia.

Interviewer: Let’s talk about this word Dystonia and then of course in medicine we refer to this movement disorders as Dyskinesia. Is that right?

(00:00:32) Respondent: Well, Dystonia is a type of movement disorder and Dystonia involves patients that adopt almost uncontrollable awkward postures and they can occur sporadic throughout the day or can be triggered by various events. Often these postures are very painful. One of the most common that we see is cervical Dystonia and has another name Torticollis. You meet people with this occasionally and their heads are turned in one direction or another and this posture can be adopted constantly and the patients are in a great deal of pain because of it.

Interviewer: What about Dyskinesia? What's that mean?

(00:01:03) Respondent: Dyskinesias are uncontrolled movements and we most frequently see them in the context of people with Parkinson’s disease. Specifically patients with Parkinson’s disease that are being treated with very effective medicine, it’s a dopamine type drug, Sinamed, however, in treating the basic symptoms of Parkinsonism they develop these abnormal movements, Dyskinesias. And the Dyskinesias can almost be as disabling as the disease itself especially if they have been on the medication for several years.

Interviewer: Oh, since we have these three different categories then of things that can go wrong. Tell me what is the mechanism for these if we take a look in the brain?

(00:01:41) Respondent: There are many models for what goes wrong in the brain; probably the best to understood is Parkinson’s disease. Parkinson’s disease is a type of neurodegenerative disease and that means part of the brain is actually degrading and the cells and the brain are dying overtime and there is a specific region of the brain that’s affected in Parkinson’s disease that is substantia nigra which is a region of the brain that produces dopamine. The dopamine is used to excite and inhabit various circuits that are important for moving and for initiating movement and for stopping movement. And that’s why when you see Parkinson’s patients many of them have a very hard time just taking that first step forward or making it through a doorway or arising from a chair. So these circuits are very important, it’s sort of our basic modalities of getting around the house during the day and they have a great deal of problems with that. The thing that really altered the treatment of this disease was the development of dopamine energy drugs or drugs that affect the dopamine system in the brain and that really has affected how long these patients can actually survive and so most Parkinson’s patients actually have a normal life expectancy at this point, thanks to the medical therapies that we can offer them. We additionally can offer a surgical treatment for this type of disease, its called deep brain stimulation. It’s a way of treating these patients when the patient develops side effects to the medicines that have just become too severe or the fluctuations during the day associated with their medicine
doses have become so strong that the medicine is just not tolerable anymore. And this surgery involves us actually placing the stimulation of electrode into a region of the brain that’s hyperactive.

Interviewer: Let’s talk about this placement of these electrodes. Why would placing them in an area of the brain that’s got too much activity going on help with this symptoms?

/respondent: That’s a great question. It is an area of active research actually because there are certain regions of the brain, it’s a very small nucleus, it’s about the size of the finger nail on your pinky finger. Because it’s so hyperactive, it’s acting abnormally and its normal circuitry that had effects because it’s too hyperactive and that’s what sort of shuts things down. But with the electrical stimulation, we’re able to turn down that hyperactivity in some manner that we’re not too sure about yet. We’re able to quiet the cells down that live in that nucleus.

Interviewer: How interesting. So we’re actually using some kind of stimulation of this in order to turn it down.

/respondent: Exactly.

Interviewer: Now is this also the same way that it works in essential tremor?

/respondent: We’re probably even less sure about how the electricity works in the brain but there is a region of the brain that aids in passing information from the cerebellum which is on the posterior aspect of your brain and is useful for coordination and movement control. There is a region of the thalamus that passes this information up to other regions of the brain, the cortex included. It seems to be functioning abnormally or passing abnormal signals because it’s centrally located this region of the thalamus, it’s easily accessible with a deep brain stimulation of electrode and so that’s the case that it is also becomes a safe situation for us to place one of these devices to alter the abnormal activity and decrease the tremors that these patients experience.

Interviewer: Let’s talk about the surgery itself. How is that done and then how do we power these devices, how often do their batteries need to be changed?

/respondent: That’s right. These devices do have batteries. The surgical procedures performed in an operating room and for the most part that patients undergo this procedure are away because we want to interact with them while we’re performing the surgery. We do a lot of testing on electrodes that we implant, we apply electricity to them to make sure that patients don’t have any side effects from the stimulation and we also want to make sure that the stimulation is working that is stopping the tremors that it’s making them move in a more fluid manner in the case of Parkinson’s disease. So we can do a lot of testing in the operating room itself. Once you’re convinced that you found a good location for implanting the electrodes then you close all the wounds up on the patient and typically we bring the patient back in about a week and we put a battery in and so everything about this system is actually under the skin, self-contained inside the patient. The batteries have a variable life time from three to five years.

Interviewer: How about changing the batteries? What’s that take?

/respondent: That’s a fairly easy procedure. It’s usually done under local anesthesia and the pocket is opened, fresh batteries placed and the cables are reattached. It’s a fairly quick procedure and it only takes about 30 minutes to perform.
Interviewer: When we talk about the placement of the electrodes they must sneak up from the head.

(00:06:07) Respondent: Yeah that’s right. They are under the scan but they do travel in a little pocket behind the ear and then the cables traveled over the scalp to where they enter the skull bone and traveled down deep into the brain. But all that is again under the scan and if we place it well behind the hairline so you can actually see the bump from the cable.

Interviewer: So a little tinny tiny cables sounds like.

(00:06:26) Respondent: They are fairly small, that’s like a little wires.

Interviewer: It seems to me this kind of treatment for Parkinson’s might actually be preferable to taking medication that could have a whole host of side effects?

(00:06:36) Respondent: That’s a excellent point and overtime what we realized one of the most important benefits of these devices is that it enables the patient to decrease the amount of medicine that they’re using during the day and that gets rid of a lot of these very annoying side effects that they suffer from that Dyskinesia is being one of the main ones.

Interviewer: Surely. So what are your thoughts on the matter? Would you suggest that as we get better at this or more people do it that we might actually be treating more people with Parkinson’s this way?

(00:07:02) Respondent: I think that’s an area of active investigation. One of the things that we used to do, we would wait until these patients got pretty sick before we put these devices in and question arises should we be putting these devices in earlier to get them a better quality of life sooner?

Interviewer: And I guess I would ask the same question about essential tremor which we know affects so many people?

(00:07:22) Respondent: And there the jury is even less convinced about that but I think at some point we may find ourselves inplanting these devices in younger, healthier patients that are more disabled by their conditions rather than waiting until a caregiver is having to do most of their activities of daily living for them. But I think we will have the answer to that over the next few years.

Interviewer: That must be an area that we are doing research on here.

(00:07:43) Respondent: Because there aren’t many of these patients to practice, it takes many centers collaborating together to generate the data for this so often that there will be one or two trials running nationally to study these questions involving five or six centers in each trial. We have to pull our resources because it’s a fairly rare disease.

Interviewer: I know that we have a Parkinson’s center here. Would you say that someone who is particularly bothered by their Parkinson’s disease ought to be seen in such a center?

(00:08:12) Respondent: The first step is to find a good practicing movement disorder neurologist and many of these are at some of the larger academics centers and Johns Hopkins being one of them. I do think it’s a good idea at least to get a second opinion with the movement disorder neurologist as you move forward with your disease treatment.
Interviewer: Would you suggest that there could be expansion of the use of these kinds of treatments in other movement disorders that might arise from a different reason.

(00:08:35) Respondent: Yeah that’s an excellent question and there are active studies ongoing to investigate the use of this therapy in Tourette’s syndrome and even in psychiatric conditions like major depression and schizophrenia and in obsessive compulsive disorder. It maybe that we have learned a little bit about how we can control specific small regions of the brain with this electrical stimulation device and as we learn more about other conditions of the brain it might be useful in helping us either shut down or increase the activity of other regions.

Interviewer: What else would you like to add about deep brain stimulation?

(00:09:07) Respondent: We become much quicker with the implementation in the operating room and many groups are not using the frames that attaches to the patients head that help us guide the electrode and it’s possible even to place these electrodes inside an MRI magnet so we’re really advancing the methods we used to place these electrodes. I am very excited about offering this procedure in the future in a very safe and comfortable manner for the patient.

Interviewer: Excellent. Thank you so very much.