

Ruth Adewuya, MD:

Hello, you are listening to Stanford Med Cast, Stanford CME's podcast where we bring you insights from the world's leading physicians and scientists. If you're new here, consider subscribing to listen to more free episodes coming your way. I am your host, Dr. Ruth Adewuya. In this episode, doctors Michael Leong, Scott Pritzlaff and Ravi Prasad discuss neuromodulation or neurostimulation, it's application, optimizing outcomes and advances made in recent years.

Michael Leong, MD:

Hi, everyone. Thanks for tuning in. I'm Michael Leong, the Director of Neuromodulation at the Stanford Pain Management Center. We've been getting a lot of questions, not just here, but also Scott and Ravi about neuromodulation, both from patients as well as from physicians. So we wanted to take some time today to talk about neuromodulation and what it is. It's defined as the alteration of nerve activity through targeted delivery of a stimulus, such as electrical stimulation or chemical agents, to specific neurological sites in the body. It's one of the fastest growth areas for technology to address chronic pain. Some of the examples that you guys already know are transcutaneous electrical nerve stimulation, spinal cord stimulation, and intrathecal drug delivery systems or these pain pops. Neuromodulation is a huge area, so we need to pare it down a little bit for this session. I'd like Dr. Pritzlaff or Scott Pritzlaff left to talk a little bit about neurostimulation in specific. I'm going to go ahead and turn it over to Dr. Pritzlaff to go forward and discuss neurostimulation in more detail.

Scott Pritzlaff, MD:

Thanks, Mike. Thanks for having me again. Just for everyone, I'm Dr. Scott Pritzlaff. I'm an Assistant Professor at UC Davis and the Program Director of the Clinical Pain Medicine fellowship. Mike, you bring up some very good points. What's interesting, I think, when you talk about neurostimulation is this is a vast exciting field of options that are available. I know, personally for me, something that I specialize in is something called peripheral nerve stimulation. And really, what this entails is via very technical imaging guidance, ultrasound guidance, I place small little wires next to nerves, often nerves that are damaged or sources of patient's pain, and then using electricity, we stimulate that wire and effectively block and/or modulate, meaning really changed the character of a patient's sensation and really decreasing their pain.

Scott Pritzlaff, MD:

So unlike say 10 years ago, even 15 years ago when you talked about something like neurostimulation, you were really referring to things like TENS units, which, Mike, you alluded to, or even something like spinal cord stimulation, which involves placing leads or wires into the epidural space, so into the spine, the spinal column or the spinal area. This field has really rapidly expanded beyond that initial starting point to where now, there's some really, really cool devices. The other thing that we're doing is something called DRG stimulation or dorsal root ganglion stimulation that involves once again, placing wires near the spinal column, but instead of in the epidural space, near the collection of nerves entering the spinal column where effectively, all the afferent or sensory impulses are traveling through this area called the dorsal root ganglion. With very small amounts of energy, you're able to target patients' pain. So really, there's just a lot of exciting things that are going on, a lot of options that are available for patients when we talk about this space.

Ravi Prasad, PhD:

Thank you for that, Dr. Pritzlaff. This is Ravi Prasad. I'm a Clinical Professor at UC Davis Division of Pain Medicine and the Director of our Behavioral Health Program. I'm a psychologist by training and one of the things that is exciting from my perspective about neuromodulation therapies is that this is a non opioid therapy for pain. In this day and age, over the last many years, there's been a lot of concern about opioid medications and unintended consequences of their use in the domain of pain management. In 2018, nearly 70% of all overdose deaths were attributed to opiate medications. So it's really important for us to be able to find additional therapies to help with managing pain that don't present with this high morbidity rate and things that we don't have to worry about issues, such as addiction or dependence, things along those lines. So the advances in neuromodulation technology is something that's extremely exciting from my perspective.

Scott Pritzlaff, MD:

The other thing, Ravi, that I would also include and just to dovetail on what you're saying and certainly, Dr. Michael could also interject as well is even outside of opiates, the thing that has always been challenging and difficult as a pain physician is that we employ a lot of non opioid medications as well for treating pain, specifically nerve related pain or neuropathic pain. Inevitably, patients and physicians alike have heard of medications like gabapentin or pregabalin, or even some of the older tricyclic type medications that are employed for chronic pain. What I would say about these medications is they really have a lot of systemic effects. Particularly for patients who are elderly or even patients who are high functioning, patients who don't want to be mentally clouded, these are not without risk or not without consequence or side effect. So I think that is additionally something that can make some of these therapies that we're talking about attractive and employed and used much earlier in a treatment algorithm as opposed to something that's used as a last resort, don't you think, Mike?

Michael Leong, MD:

Let me add a couple things too. Of course, if you could choose to not take medicines forever and forever and to have to take them three times per day or more, of course, you're going to want to do something that is relatively easy. The thing is about these devices, what's cool about it is that in many ways, you actually get a trial run about it before you even put in the permanent. So there are ways so that you can figure out if it's going to work or not versus just taking a medicine like gabapentin and just being on it for months and months and trying to titrate up slowly and having to deal with some of the sleepiness and dizziness. But you actually get a trial run with these things before you even buy the technology or buy the car. What do you think about safety profile with these? Do you think that they're relatively safe, especially the newer peripheral nerve, tiny wires that you're putting in?

Scott Pritzlaff, MD:

What I would say to the audience is on the whole, many of these devices are safe. Most, if not all, of the devices we're talking about, with the exception of perhaps some of the topical or devices that may be placed on the skin, have been extensively vetted by the FDA. So from a safety perspective, they're fairly safe with some evidence to back that up. But I would say with some of the more invasive devices that go in the spine, they're not without risk. Certainly, as a group, we'll talk about the patients who are optimal for those devices. But on the whole, I would say that there is a body of evidence, as well as longitudinal data over years, to suggest that a lot of these devices can be safe alternatives for medication like you were saying, Mike, and can be used effectively and safely.

Ravi Prasad, PhD:

Jumping back to a point that you initially brought up, Scott, and that Mike elaborated on, the issue of the side effects associated medications, that's a pretty significant issue. I've met many patients who start to exhibit signs and symptoms of depression or a sense of helplessness when they've been taking even a non opiate medication that's provided them with some degree of relief. They say, "This is the first time that my pain has been better controlled. Not that my pain has been eliminated, but it's been controlled such that I'm able to engage in the things that give me quality of life, but I ended up needing to take more and more of the medication because I developed tolerance. I start to have dose limiting side effects," and they start to get frustrated because they feel like they have no additional place to turn and it can start to have an effect on the person's overall emotional well-being.

Ravi Prasad, PhD:

So being able to have an alternative pathway, a potential alternative pathway to address these particular issues is very exciting. With that, over the course of time, and Scott, you started to allude to this earlier on in one of the comments you made, neuromodulation is certainly not a new area, but there've been a lot of advancements in recent years. What are some of these advancements? I was wondering if you and Mike might be able to elaborate on some of that.

Scott Pritzlaff, MD:

A few of the devices that I can at least speak to; TENS therapy, which is transcutaneous electrical neurostimulation, which is actually quite old, has been around for some time, which essentially, involves placing an adhesive pad on the skin and using low voltage electrical currents. You can stimulate nerve fibers to really give pain relief and this has been used in a variety of conditions; things like osteoarthritis, fibromyalgia, a lot of what I would consider to be chronic conditions, even low back pain or diabetic neuropathy. That therapy has kind of sprouted into lots of different offshoots.

Scott Pritzlaff, MD:

There is now high frequency, essentially almost like a high frequency impulse therapy or TENS device that's now available. There's also different kinds of other variants of TENS that are out there. So that is really something that's exploded in its availability, so much so you can go to, say, Walgreens or one of the large chain pharmacy stores in the United States and pick up a TENS unit and are sold kind of on the internet. The other thing, and Mike can also discuss this, there are some of these newer external stimulators, things like vagus nerve stimulators, that have been used for things like headaches, chronic headaches, chronic migraines, even depression, things like that. So there's a lot of innovation that's ongoing. What other things am I missing, Mike?

Michael Leong, MD:

I think you covered a lot. So if I had to group it in an category, so we're simple, I'd say that there are some that patients can get and use themselves. So those would be TENS units, transcutaneous electrical nerve stimulation, you mentioned about the high frequency impulse therapy or HFit, And also there's other ones. There's something called deep oscillation therapy and other patches and things like that. Those you can actually either get at a pharmacy or drug store or buy them online and you can use them yourself. You don't have to have somebody else kind of teach you how to do it. Other ones like the one you alluded to, the vagal nerve stimulator or vagus nerve stimulator, it actually is interesting, I think for all of us, because we've known it when neurosurgeons have to implant this thing into the neck near the vagus nerve surgically, and you had to bury it and do all those kinds of things.

Michael Leong, MD:

But now, there's a device that the FDA approved that you just place something that you purchased or that is approved by the FDA, you place it just on top of the surface of the neck in order to treat depression and headaches, cluster headaches and migraines. Before, the internal one was more for depression and epilepsy, but now, you treat depression, headache, and believe it or not, and before everyone runs out to buy this, there is some usage that was for emergency approval by the FDA for treating COVID related respiratory distress using neurostimulation, which I thought was just unbelievable.

Michael Leong, MD:

The reason why is that it treats something called cytokine cascade when somebody is in really bad condition and really heading towards the intensive care unit. So before everyone wants to run out and buy a vagus nerve stimulator, it's only for very specialized cases of COVID. But the fact that you can treat something like that, we're not even talking about pain anymore, but talking about other kinds of immunological cascade really kind of blows my mind. What do you think it's looked like for you during your career for some of the more conventional things, the spinal cord stimulation devices where you put the leads near the spinal column? Do you think there's been much difference over the past 10, 20 years?

Scott Pritzlaff, MD:

There's been dramatic advancements. We could go into very granular detail, but I think for the audience, things that have changed include the actual, what we call wave forms, meaning the way the spinal cord and even I was talking about the DRG, the dorsal root ganglion, how they are stimulated, the types of waves that are delivered, that has changed dramatically now. There's different patterns, something called burst stimulation, high-frequency stimulation and there's a lot of trial data surrounding some of these newer wave forms that they can be more effective in some ways than traditional, what we call tonic wave forms, that were so prevalent when spinal cord stimulation came out 20, 30 years ago. So I would say that from an efficacy standpoint, there's been a lot of advancement in the wave form realm. There's also been advancements, frankly, and just the actual hardware. These spinal cord stimulators now are, for the most part, with the exception of say DRG, there is some MR conditionality, MRI conditionality to them, meaning patients can get MRI scans under certain conditions.

Scott Pritzlaff, MD:

The battery size is much smaller, so much, Mike, I'm not trying to say that you've been in pain medicine a long time, but you probably can remember when 10, 15 plus years ago, the batteries were much larger. [crosstalk 00:15:44] A lot of these systems are now readily rechargeable and can give patients a lot of freedom to recharge the battery. So I think this speaks to the whole Renaissance and technology that we have worldwide. Everyone now has some handheld phone device. So even some of these stimulators on the realm, I mentioned, even in what I'm interested in, peripheral stimulation, some of the peripheral stimulators even linked to your cell phone and allow you to control them with your cell phone device, which is very cool. It's very tech savvy and very patient friendly.

Michael Leong, MD:

Hey, let me jump in just for one moment. So I want to make sure that everyone out there knows too, that older spinal cord stimulation systems doesn't mean that they're bad. It just means that they are a little bit older. What Scott mentioned is that sometimes you can actually have older systems that you can change out their generators or their battery packs and get some of these newer wave forms. We

think that they're better. The reason why we think that they're better is not just because they were studied versus the older systems and it seemed to have a little bit better efficacy or effectiveness, but the truth is that we think that with these newer systems where you can't really feel the tingling and you can't feel the buzzing, that maybe it lasts a little bit longer, maybe it tricks the body and toward to have more effectiveness for a longer period of time.

Michael Leong, MD:

We don't actually know precisely which one is better. There are some medical center, Stanford being one of them where Dr. Sulmasy is doing a clinical trial on some high-frequency system versus this other one called a burst type of technology. I know that other medical centers, probably UC Davis too, is working on different trials trying to figure out which one is better for a different pain condition. I remember too, sorry, you're dating me as well, where we used to use these internal spinal cord systems and try to pop them out and do that as the peripheral nerve stimulator versus what we have right now, the tiny wires that you put in under ultrasound. You want to mention how involved it takes in order to put something... Because funnel cord is kind of involved, right? You have to go to the operating room, have big C-arm, x-ray machine, all this other stuff. Peripheral nerve stimulation for extremity pain or pain in the arm and legs or around the hip region, don't you think it's a lot easier to do?

Scott Pritzlaff, MD:

Sometimes. I would say it can be a lot easier, but the benefit to the patient is that this often can be done instead of in the operating room, in kind of a outpatient procedure room sort of setting. It can be a lot quicker with much smaller incisions. So really kind of falls under that minimally invasive category. But I think it's important to say that peripheral stimulation really requires one to narrow down pain to a smaller distribution, meaning pain that's really attributed to a single nerve or maybe a few nerves causing someone's pain. So I could talk all day about some of the nerve injury patients that I see, but kind of general buckets in the peripheral nerve realm, I'm seeing patients who have had kind of lower extremity, sometimes foot and ankle surgery, or even post-traumatic patients who have had amputations and certainly, in the peripheral nerve realm and the literature, amputation pain can be one of the indications for peripheral nerve stimulation. So it's very interesting what we can do now with very small incisions percutaneously, meaning inserting leads or wires through the skin close to nerves.

Michael Leong, MD:

Ravi, we need to talk about the process about how do we figure out who's right and who is not quite ready for neuromodulation? And then also to pick which devices for therapy. How's that process work for you guys?

Ravi Prasad, PhD:

I would actually say that just the entire process of neuromodulation, I think it's important to recognize that it's one piece of a larger puzzle of treatment. If you think about pain management as being a tripod with multiple legs or a tricycle at three wheels, certainly you've got the medical optimization piece, you've got the physical reconditioning, you've got the behavioral and lifestyle management. If you put all your eggs in one basket and expect that this one thing is going to make all the difference in the world, you may sell yourself short. Certainly, there are some situations in cases where just the one intervention is helpful for patients, but more often than not, what we find is that we really need to employ a true multidisciplinary approach to help patients maximize their outcomes, which means we need to make sure that our patients are still participating in some sort of a home exercise program. We need to make

sure that they're continuing to apply different behavioral strategies, make sure that any aspect of distress is appropriately managed, that they're managing their regular life stressors well, things along those lines.

Ravi Prasad, PhD:

So neuromodulation strategies should be considered a part of a larger multidisciplinary treatment and not necessarily the end all be all just by itself. But to the question that you specifically asked, Mike, how do we determine who's an appropriate candidate? Here at UC Davis, we employ a system that's very similar to what you all do at Stanford, which is also very similar to what's done at the Cleveland Clinics. I know that Dr. Vafi Salmasi, who was at the Cleveland Clinic, had a model that they used for pre-screening folks and then kind of fast tracking them through to try to determine who's appropriate, who's not appropriate, what are some of the red flags that come up? And not just from a psychosocial perspective, but even from a medical perspective. You take somebody, for example, who's had extensive surgery in their lumbar spine, is it even technically possible to get leads inserted into this person's back?

Ravi Prasad, PhD:

So looking at the case from the medical perspective, psychological perspective requires a meeting of all the minds that are involved. So I know Dr. Salmasi was involved with these types of interdisciplinary meetings at the Cleveland clinic, but then when he came to Stanford, he brought that to Stanford and implemented a similar neuromodulation committee at Stanford University. Then when Dr. Pritzlaff and I came to Davis from Stanford, we applied that same approach to our neuromodulation process over here. So what it basically is, is an interdisciplinary approach where psychologists, physician, multiple members of the team weigh in to discuss the patient's candidacy. From a psychological perspective, I specifically look at the patient's understanding of the procedure and its associated risks. When we talk about neuromodulation, even though the devices have gotten smaller, is a patient comfortable and do they understand that there's going to be a device implanted in their body? But if you have somebody who's extremely petite and if they have not too much adipose tissue, there's a possibility that you may be able to see the battery pack in their body.

Ravi Prasad, PhD:

Are they comfortable with what that's going to mean for them? Are they aware of the risks? Many times, we have patients who are so desperate for any type of pain relief that they don't really fully comprehend that there could be some adverse events that occur. Although they're minimal, they're still important for patients to understand what these things are. Making sure that patients have appropriate expectations of the relief they may receive is also important. If a patient's threshold for success is 90% relief and from a physician perspective, you perceive 50% relief would be satisfactory, well, the patient may get 50% relief and you consider that this was a great success, but from the patient's perspective, it's a failure. So we want to make sure that expectations are appropriate and consistent with the treatment that the patient's receiving. It also, you want to make sure that the patient can cope with an unsuccessful trial.

Ravi Prasad, PhD:

If the patient's putting all their eggs in this one basket and if it doesn't work, they have no coping mechanisms to deal with that, that's a dangerous place to be. I often tell patients that there are only three possible outcomes from the procedure: things get better, nothing changes or things get worse. It's

important for patients to be able to articulate how they cope with each of those different outcomes. Then also, look at their compliance history. Look at the presence of psychiatric distress. Look at substance use behaviors, things along those lines. It's not that a person can't have psychiatric distress. There's a lot of psychiatric distress that's present, but how stable is that distress?

Ravi Prasad, PhD:

So people who are depressed or anxious, just the presence of depression or anxiety doesn't preclude somebody from being an appropriate candidate for a device, but whether or not those things are stable, whether they're plugged into appropriate treatments, that's the part that's a little bit more important. So from a psychological perspective, these are the things that I tend to look at to determine whether somebody is an appropriate candidate, but this is just one part of the puzzle. I know that from a medical perspective, Scott and Mike, you guys also have different factors that you look at. So what are some of the things that you look at during our neuromodulation conference?

Scott Pritzlaff, MD:

Speaking for me, certainly, the comorbidities of the patient. One of the big things that is a huge consideration, and this is no surprise to anyone, but there are an immense amount of anticoagulation medications that patients take now. For some of the higher risk neuromodulation, neurostimulation therapies, most of the time, actually these medications need to be discontinued for a period of time and that may not be reasonable if someone has a pulmonary embolus or some sort of clotting disorder. For peripheral nerve stimulation, oftentimes we're able to do that procedure when patients are still on anticoagulation therapy or blood thinners. So that's sometimes can steer the conversation. The other thing, and Mike can comment on this because Dr. Leong has a close collaboration with neurosurgeons, but sometimes a patient who's had extensive fusion surgery of the spine is almost impossible without a surgeon actually going in and implanting leads near the spinal column, that that can be a possibility. So sometimes it's... You alluded to that, Ravi, that anatomically, it may be very difficult.

Michael Leong, MD:

Yeah. I would agree with a lot of what you said and that for any patients out there, people potentially thinking about this therapy, we really do need some interesting studies like an MRI or a CT myelogram in order to make sure the pathway is clear or wherever we're going to go to place the leads. One thing that been brought up yet is social habits and believe it or not, tobacco can prevent wound healing and can promote infection. We're not really on a tirade against that specifically, but if you're going to have basically one, maybe two chances in your lifetime in order to get these kinds of therapies, you got to make it the best possibility that it's going to be effective and stay in without becoming infected or having a problem with it. So oftentimes, we'll ask our patients to be off tobacco for two months or so, and it's not just us. It's also with spine surgery and other kinds of parts of medicine too where everyone is worried about wound healing and infection.

Michael Leong, MD:

One last thing that I'll mention, Ravi, is that I heard this thing about the tripod of pain in the past, and I get slightly annoyed with it because I think that people think about medicines, they think about physical rehab and they think about pain psychology, but they forget about something like interventional pain and that really is the fourth leg of the chair for me and it sort of encompasses everything including neuromodulation and epidurals and all the other things that are different topics.

Ravi Prasad, PhD:

That interventional therapy in my little tripod model, I always include that as part of the overall medical management, kind of looking at medications, looking at the role of interventions as additional surgical care needed because I see all that falling under that broad scope of the medical management. The medical management, certainly as a very large domain.

Ravi Prasad, PhD:

The reality is, is I think probably the tripod isn't doing it full justice because what it does leave out is it actually leaves out other alternative medicine therapies that are showing evidence as well of being able to help people who are living with chronic pain conditions. Certainly, things like acupuncture, things along these lines that we know also exist in this pain world that can be very helpful. So I think that moving away from that tripod model and just looking at it as being a multifaceted model would be a more appropriate way to look at it.

Scott Pritzlaff, MD:

So it looks like we're going from a tripod, to a chair, to a long dinner table model, meaning more legs keep getting added and I couldn't agree more, even things like nutrition. We could talk at length, but there are a lot of components to optimal pain care.

Ravi Prasad, PhD:

Related to that, I also want to mention, and I had touched on this before, that just the presence of psychiatric issues doesn't preclude a person from getting a particular device. It just might mean that some of those things need to be optimized before they go forward. To the point that Dr. Leong made, a lot of times insurance companies may just give somebody one or two opportunities to take advantage of these therapies in their lifetime. We want to make sure that if we're moving somebody down this treatment pathway, we give them and their bodies the best opportunity to get maximum benefit. So we've certainly had cases during my time here at UC Davis where we'll see somebody who, for example, we saw a patient who had, during my evaluation, there was significant PTSD related to some trauma that they had that had resurfaced.

Ravi Prasad, PhD:

We talked to that person about getting treatment for the PTSD, what that treatment would look like. They followed through on the recommendations. They came back for a reevaluation with myself. They still had PTSD. They're not free of PTSD, but all those symptoms are better controlled. The effect of distress was under better control. All of it was optimized, such that they were a candidate for the interventional therapies where there wasn't concern that the high level of emotional reactivity might result in a false negative during a trial in terms of their assessment of the efficacy of the device itself. So it's not necessarily a, "Do not pass. Go," it's more of what can we do to optimize this person's care so that they might be able to maximize the benefit that they get from the treatment.

Scott Pritzlaff, MD:

Well, at this point, don't you think we have a fun, interesting way to wrap up here, which Dr. Prasad will do some, what I would consider to be rapid fire questions here at the end to kind of solidify some of the concepts, and maybe for those who are listening who really want to see how these therapies can benefit their patients.

Ravi Prasad, PhD:

So I'm going to shoot off three rapid fire questions and I'll have Dr. Pritzlaff answer first and then Dr. Leong. You need to answer in 15 seconds or less, then I'm going to cut off your mic if you go longer than that. So first question, 15 seconds or less, Dr. Pritzlaff, when is it reasonable for primary care to refer a patient for neuromodulation?

Scott Pritzlaff, MD:

I would say if a patient has failed one or two medications and done a reasonable course of physical therapy, it may be reasonable. So I think the short answer is sooner rather than later if they're not improving.

Ravi Prasad, PhD:

All right, sir. I gave you two seconds over, but that's okay. We're friends. So I'll let you do that. What about you Mike?

Michael Leong, MD:

Sooner than later, and not just for chronic pain, but also for acute pain as well.

Ravi Prasad, PhD:

All right. This time, we'll let Dr. Leong start first. Who should referring physicians, whether it be primary care or other specialists, who should they send their patients to to determine if these therapies are appropriate?

Michael Leong, MD:

I would go to any board certified pain management specialist in your community, doesn't have to be an academic center, but somebody who's been trained in these therapies in the past 10 years.

Ravi Prasad, PhD:

Scott?

Scott Pritzlaff, MD:

I would echo Mike said, but I think depending on the therapy, it should be a high volume center. There's an enormous amount of diversity across neuromodulation. So depending on what you're looking at, you want to make sure that this is someone who is doing that therapy frequently.

Ravi Prasad, PhD:

And I'll add to that as well, but ideally, you'd want it to be a place where they also have an in-house site or at least they have regular relationship with the psychologist who does a pre-screening evaluations so that whatever response they give can be a comprehensive response in terms of the person's candidacy and if there's any additional optimization that needs to occur. Then lastly, and I'll let either of you kind of address this, it's a free for all. Is this covered by insurance?

Michael Leong, MD:

You want to go first, Scott?

Scott Pritzlaff, MD:

Yeah. The short answer is it depends, depends on the therapy, depends on the insurance. Rather wide coverage for spinal cord stimulation, but a lot of the other therapies, which are new in the past 10 years, it depends is the short answer.

Michael Leong, MD:

So for spinal cord stimulation and DRG or dorsal root ganglion stimulation, the approval was essentially, for back and leg pain or for specific type of nerve pain, which is called complex regional pain syndrome. So for those two conditions, the approval is probably a lot easier than other pain conditions that we use neurostimulation for, which would be headache and abdominal pain symptoms and other kinds of areas, even pelvic pain sometimes. So it really does depend.

Michael Leong, MD:

It also depends on the framework that you've had in order to build up to it and that's where Dr. Prasad, Ravi, you alluded to this, that you have to go through the process in order to not exhaust, but to at least say to an insurance company or another provider, you've tried all reasonable options before you get to this because everyone wants it to be successful. You don't want to do a trial when it's premature or if it's in a condition that you just don't think it's going to really help all that well, hence our neuromodulation conferences where we can discuss it as a group, educate not only ourselves or each other, and then kind of promote some of the newer things that not everyone is familiar with.

Michael Leong, MD:

Hey, I got another last rapid fire question I didn't tell you guys about, which I think everyone can participate in. I think it's an easy one. Is there a patient or a success story that you have for someone that you thought was really cool where you used neurostimulation and you got a result that you didn't expect?

Scott Pritzlaff, MD:

I have a patient. Just quickly, she was two and a half months following removal of a ganglion cyst on the top of her foot. She had a lot of very extensive kind of depression, anxiety, and I want to say in a lot of ways was postoperatively marginalized by the medical system. People said, "Hey, you're fine." The surgeon said, "You're fine," but she was in a lot of pain. We did a peripheral nerve, a temporary peripheral nerve stimulator for her and she came back two months later. We pulled out the wire. Her pain was essentially gone. I saw her two months later and it was for me, a revelation because it was like she was a different person. Her mood was so much better. Her pain and functioning was better and really was a huge success and kind of alluded to something for me, solidified that some of these therapies can be used in that acute and subacute phase of pain.

Ravi Prasad, PhD:

I'll have an example of a patient who previously had an old device implanted in the nineties, had an X planted because of a lack of efficacy. They been living with pain for many years. As technology change, it was proposed that they're paying also changed. So insurance was allowing them to get another trial. This was the last that they were going to get, but because it was for a different region and a different device, this was basically the last opportunity that they're going to have to try stimulation.

Ravi Prasad, PhD:

They happen to participate in an eight week pain management coping skills class that we have and the patient, through a combination of both the neuromodulation and their active use of their behavioral strategies, was able to achieve healthy outcomes. They're able to maintain involvement with work. They're able to become more actively involved with family life, things along those lines, and the patient themselves said that it wasn't either one of the treatments that help them do that, but it was really the combination of learning the behavioral skills and getting the relief from the device that they both help each other and that's the true model of what we want to see with this interdisciplinary approach.

Michael Leong, MD:

Those are both wonderful stories. I have one last one too, where there's a patient that I have been treating in the pain management center for over 20 years and actually, had already tried neurostimulation, as well as a trial of [inaudible 00:37:46] medicines that was unsuccessful, but really dealing with this very severe and very physically sort of life-changing complex regional pain syndrome of the person's leg and also, developed other medical conditions so that they had some pretty severe lung and heart issues where we actually implanted, both a spinal cord stimulator system and DRG system for severe pain, and it's the first time that she's really had over 50% of pain relief in the past 20 years all from this new technology, all from the things that we would have just been talking about.

Ravi Prasad, PhD:

All great stories and I think like true academicians, we showed that we can take rapid-fire and butcher it and non rapid fire responses. So we're all true academicians. But with that, I think that our take home points, though certainly, is that neuromodulation is exciting. There have been a lot of exciting advances in recent years that with appropriate patient selection, from both the medical and psychological perspective, we can have healthy outcomes, but we want to make sure that those things are all optimized.

Ruth Adewuya, MD:

This podcast was brought to you by Stanford CME. To claim CME for listening to this episode, click on the, "claim CME," button below, or visit medcast.stanford.edu. Check back for new episodes by subscribing to Stanford Med Cast wherever you listen to podcasts.