

## Managing Spasticity and Tone

You can listen to the audio of this talk at: <https://youtu.be/idb55UJ4tB4>

**Dr. Jason Poon:** [00:00:00] Today we'll be talking about an overview of spasticity and hypertonic signaling, and how many disclosures. So, how common is spasticity? And the answer is very common. We don't have exact numbers for NMO, TM or ADEM specifically, but knowing from other diseases, it's very likely the good range is 40 to 70 percent, with maybe half of those being what we call problematic spasticity impairing function.

[00:00:23] So what is spasticity? And so the very academic definition of spasticity would be an increase in tone that is velocity dependent, and due to a disconnection between the brain and muscles. So normally what we have here is a, descending pathway from the brain, through the spinal cord, to the muscle that controls how well and how excitable the normal reflex of a muscle is.

[00:01:02] So normally, a muscle will contract to a rapid jerk. And that makes it so that it protects the muscle. But it is not controlled well by the brain, and through the spinal cord. Then what you kind of have is this beating, where you have an overcompensation on one side, that leads to an overcompensation on the other side. And, you can get this chromis, this beating motion here. But in reality, clinically, spasticity manifests in many ways. Some people have increase tone baseline, and that gets worse with velocity. Other people don't have any increase in tone but will have spasms. And so this is a patient on the bottom left, who has NMO. And if she tries to extend her hand, she'll have these tonic spasms that lead to a fist clench.

[00:02:00] So, given that, we're going to talk about overview very quickly. So we're going to talk about the goals of spasticity management, how we evaluate it, what are some common patterns. And then we'll go into some of the ways that we treat it with oral medications, injections. But most important, physical therapy, and behavioral management.

[00:02:18] So, what are the goals of spasticity management? And there are many reasons, and here are a few. Some of the goals would be decrease in pain, from spasticity. Another thing would be increasing mobility and preventing contractures. A contracture is when a joint stays in a position for a long time. It will, become fibrotic, and it won't move anymore unless it's surgically managed after that.

[00:02:46] Also, if you keep a limb in a position for a long time you can have skin breakdown and hygiene issues. So those are important things to manage. However, not all spasticity impairs function, and so we want to be able to delineate between the patient's ability to ambulate, and some of the good things about spasticity versus some of the bad things. So here is a patient from UT Southwestern. She has transverse myelitis, and very clearly, she's weak on both sides of her legs, but she's using the tone of her legs to kind of swing the other leg around. And that is compensating for her muscle weakness, and took that way, she wouldn't be able to ambulate.

[00:03:31] Here's another example of how spasticity not always impairs function. This is a patient from the University of Washington, and what he does is lean back. And that, it triggers extensor spasms that straighten his legs. It allows him to swing over and transfer his legs. All right, so, and that's where we want to operate, between knowing what helps you, and what doesn't help you. And being able to parse those out, to be able to best manage responses to people.

[00:04:07] So that leads us to, what are the goals in managing spasticity? What are the parts that impair your function, what are the parts that improve your function? What are the parts that are painful? And what are the parts that we shouldn't deal with? So, and then next, we want to do and examine, really understand what are the parts of the, the body that are affected by the spasticity. Is it one limb? Is it a region, like both legs? Or is it pretty much the entire body?

[00:04:39] And then we want to be able to test for that tone ourselves. One of the most common scales we have is called the modified Ashworth scale. And we'll use that and kind of clear up. So how do we treat spasticity? So, if we get nothing out of this talk, I want to emphasize that the top two here, behavioral and physical therapy are the most important of these treatments. Everything else, oral medication, local injections, surgeries, pumps, that is almost agivant to those first two.

[00:05:12] And what do I mean by behavioral? So I mean, like we were talking about in the previous lectures that we were on. We want to avoid painful stimuli. So sometimes pain will trigger spasms, which triggers more pain, which will trigger more spasms. And they get this bad cycle. We want to treat infections as best as we can. It's sometimes, that might be the earliest warning that we have an infection, is that we have more spasms.

[00:05:42] We want to avoid emotional stressors, but also environmental stressors. Like, [inaudible 00:05:48], and heat. So, and then, if we're able to, we want to be able to perform physical therapy at whatever ability that you're able to. So that includes range of motion, to weight bearing.

[00:06:05] So now let's look at some classical patterns in spasticity. Here is one of the more, most common patterns, where you have a shoulder, an arm that's attached or put close to the body. A flexed elbow, flexed wrist, and a clenched fist. And that can be problematic, because sometimes as you can see in this picture, with the clenched hand, you can see how the nails can easy grow into the palm. It could be difficult to open the hand and clean the hand.

[00:06:35] And so we want to be able to manage that with splints, like a stable splint right here. And then in this video, we want to be able to have range of motion. So here we focus on opening the hand, initially with the thumb in the flexed position. Because that gives you a mechanical advantage to opening the hand. And then, really trying to rotate over, and this, these videos are all sped up, because we want to be slow and deliberate with all your stretches.

[00:07:07] We want to be able to draw out the hand, to open the hand, and keep it there, keep it open. So now let's talk about some classic patterns in the lower limb, and here down, over on the left, we have a patient who has a inverted foot. It's kind of pointed. So we can see very easily how that can lead to some ankle rolling. In more severe cases, we have to do serial splinting, and that allows for the limb to be slowly stretched out. [inaudible 00:07:47].

[00:07:44] Sometimes we see that the quadriceps are spastic. And that leads to a straightened leg at the knee. And so, the best therapies that we have that is with this big grind, with the standing stand. And then sometimes we see a flexed hip, where the hamstrings are more affected. And then here, we can see how we can stretch that. We have a physician in a wheelchair, and he's demonstrating how to stretch out the hamstrings, along with the calf muscles with that forearm, with the assistance of another physician. Okay.

[00:08:21] And then we have an adducted thigh, and there's several stretches for that. And this is a problematic type of spasm, because it can lead to difficulties with hygiene. And so we have different stretches that allow for the hip to be rotated in and out. And that leads to better mobility on that front.

[00:08:44] So now let's talk about some of the medications. We'll start with the oral medications. Baclofen is probably the most often used medication by far. It calms down the reflex circuits. It is a short half-life, so you have to use it quite often. Three to four times a day. Some people use it with PRN, or, meaning as needed, and that's fine. But ultimately, the biggest limitation to using this medication would be some with drowsiness and concentration difficulties that we ultimately see in some of our more severe spastic cases. And then another thing we want to note is that, if you're taking high doses of Baclofen right now, you don't want to suddenly stop. We want to talk to our physicians and other providers to help us ween off. Here, we have probably our next most commonly used medication, called Tizanidine. So, this medication, we're not exactly sure how it works, but a previous medication was used for blood pressure control. And we found that when they, we did that, patient spasticity would get better. And so this next generation medication, Tizanidine took advantage of that.

[00:09:57] And we found that it improves spasticity, as well. It can be taken as needed, or as not needed. Or, up to four times a day. But it needs a slow titration. So you can't start at the high dose immediately. It also causes drowsiness and dizziness. And an important thing is that it leads to elevations in Tizanidine, if you use commonly used antibiotics, or UTIs. So that's sometimes, so we also don't want to stop Tizanidine, because it can lead to spikes in blood pressure.

[00:10:31] So botulinum toxic injections are great. Because you can really focus where you're managing things. So botulinum toxin decouples the nerve from the muscle in a reversible way, it lasts maybe three to six months. And you can really focus on a certain area, so a very problematic area, like the palm. You can focus on the muscles that do that. So, you would inject there, and then in couple of months reassess, and see if the thumb had improved in function.

[00:11:04] You can also inject certain areas of muscles so that you can change how the foot is inverted, or how the thigh is adducted. So these are important things about botulinum toxin. One of the things that we want to note, though, is that we have to, if you're getting Botox injections from other sources, for cosmetic or urinary purposes, you want to be able to coordinate. Because the body will produce antibodies against botulinum toxin, making it less effective over time. And you want to be able to group all those injections [inaudible 00:11:45].

[00:11:44] So here is a Baclofen pump. And remember a few slides ago, that some of the limiting factors was drowsiness for Baclofen orally. So to get around that, we've developed a different system where the Baclofen is delivered directly into the fluid around the spine. And in order to do that, you have to install a pump. The pump has a reservoir. It's placed underneath the skin, usually in the abdomen. And there's a catheter that extends into the spinal fluid and it delivers Baclofen much more directly, much lower doses, much faster onset. But you do need to refill it. And then that depends on what rate you're getting the Baclofen at. And it can malfunction, and you do need a surgery to install it. So those are important things.

[00:12:40] And then, lastly, we have surgeries. So surgeries are focused on lengthening the tendon, as you can see, it's usually our last resort. Or it can redirect tendons, so that they're not putting tension on certain joints and it has a much more favorable positioning of joints. So here's some old references.

[00:13:07] The next, I would like to introduce Deb Nikkila. She's an occupational therapist at Maryland School for the Blind, she'll be talking about system management, how to manage visual issues.