

Management of spasticity

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Dr. Benjamin Greenberg: [00:00:03] So we started off the morning talking about neuropathic pain symptoms which are quite common, but I'd have to say right up there with neuropathic pain is the issue of spasticity and we're delighted to have one of our friends and colleagues, Dr. Daniel Becker joins us from the International Neuro Rehabilitation Institute to give us a talk on management of spasticity. So, Dr. Becker, take it away.

Dr. Daniel Becker: [00:00:35] Well thank you, thank you for having me out here. I think last time we did Ohio, right? Was it in Columbus? All right that was a couple years ago and I remember the room was packed. So, I assume there's a lot of people who are online this time. So, thank you for having me to speak on spasticity. One of the main questions we always get, and I know the team has already done a fantastic job about talking about NMO and MOGAD and all the conditions.

[00:01:03] But spasticity seems to be one of the most pressing concerns that most people have in our day-to-day clinical practices. So, since it gets in the way with all kinds of functions, if you were to give it, if you look in the dictionary and say what spasticity is, it would be said. It's a motor disorder characterized by velocity-dependent increase in tonic stretch reflexes with exaggerated tendon jerks resulting from hyperexcitability of the stretch reflex.

[00:01:35] So if I were to mention this anywhere in the clinic, my patient's eyes would glass over, and they will stop listening to me. So, we always have to kind of make this a little bit more palatable. And so, what we usually talk about when we talk about spasticity is anything that relates to like a stiff muscle. So, some people say they have, when they get up after sitting for a long time on a plane or even just getting up in the morning, they kind of feel a bit stiffer all the way to difficulty with their posture standing upright in the right way or with balance issues.

[00:02:08] And it can affect any limbs. So, it could be your arms, your legs, but not only the limbs but also the trunk. And in very severe cases can get in the way of your day-to-day activities, including severe pain. So, one of the big questions people always have what can you do about this? I'm sure many of you remember your biology slides what is our central nervous system, which is essentially the place where spasticity takes place.

[00:02:37] I'm going to come back to that picture in a second. And you see on top left, you see the brain and then you see, as you go down to the spinal cord generally, spasticity is caused by dysfunction within the spinal cord. And if you read the causes of this, we usually say spasticity is an injury to the cortical spinal tracts and again, most people don't really know what it essentially means.

[00:03:03] So if we go back, this is the way back, then I give you the talk that I usually give to my patients. So, we just talked about on break that I just became an empty nester at my house, I had to drop off my son at college. It feels very lonely now and a lot older. But so, we compare the nerve cells or neurons in our spinal cord essentially as college kids. So, they like to party right, at least most of them. And the brain is kind of the calming humming voice of our parents.

[00:03:29] So you can say it's the mom or the dad, or it's both of them together is what the brain does. Essentially talks down the whole time down the spinal cord to this little party neurons. It's like, calm, keep it down, keep it down, keep it down. Because the natural state of these neurons is they want to party.

[00:03:53] So what happens if you have an injury to the central nervous system mostly in the spinal, usually the spinal cord that you interrupt that calming voice from the brain that keeps these party neurons down. So now they can't hear it anymore and then they look up and say, "What, we don't hear anything anymore, let's go crazy." And that's essentially what they do when spasticity happens. So, these over-excitabile neurons in our spinal cord and typical symptoms, as I said, it's increased muscle tone. We got increased reflexes.

[00:04:16] So usually when we tap on your knees and get a knee jerk and you just start flying out. Some people warn me, if you tap me here, just get out of the way. I always say it's one of the rookie medical student mistakes. If you kneel in front of your patient and tap on your knees if you have a spinal cord disorder, because you only do it once. And then you will have learned that for the rest of your life.

[00:04:52] So you can have -- or some people could have clonus, where people sort of just keep, as you tap and the knee will not stop, will not stop moving. So, all kinds of signs of spasticity and that in turn leads to decrease with function.

[00:05:08] You can have difficulty with walking, difficult with dexterity. It's a big cause of fatigue, because as you have to overcome this difference in some muscle, you have to work a whole lot harder with the intact muscles and then in more severe cases it can really form into real contractures, where the limb essentially stays in whatever position it is in, it can't open up anymore.

[00:05:34] That then could actually cause difficulty with not only mobility but also with personal care and hygiene. So, all kinds of things where we have to intervene later on. There is a couple of typical pictures here, you see sort of the hand contractors, you see the inversion in the foot. While we're talking about the foot, I know many of my TM patients complain sometimes that they have their toe curling where they sort of get curled up and they can't do anything about it.

[00:06:01] And sometimes you see even the shoes at the top of the shoe starts wearing off. That's kind of another sign of spasticity. One of the more subtle types. The most common conditions in the general public that causes spasticity is stroke, but you have others in like MS. And here we are today to talk about transverse myelitis, NMOSD, MOGAD. So, anything that can cause essentially an injury to the pathways in the spinal cord that essentially disrupts the calming voice from the brain that makes these neurons a bit more quiet. The treatment goals.

[00:06:26] So when we talk about this, well, my first question always is if somebody complains about spasticity, how bad is it? Is it something you can just manage? Is it something we have to do something about? So, because if it's just simply I feel a bit stiffer and I don't have to, I can overcome it and I don't have any functional issues with it, then I generally say we just do some conservative measures like stretching and nothing else.

[00:07:03] But once it starts sort of impacting function, they want to make sure we can improve positioning, we want to improve mobility and if there's pain involved definitely want to make sure that we can address that as well. And one of the big goals is preventing contractures. Because sometimes what I see in clinic and when people come to me, especially if they're in a wheelchair and in the sitting position at all times and the knees essentially bent at 90 degrees at all times.

[00:07:33] And then you will see as you start opening it up, there's a lot of tension in the hamstrings and so I say, we have to make sure that you prevent this from happening, because if you keep sitting in this short position because of the spasticity the muscles will get shorter and shorter. And even if you want to you can't open it up again. And especially -- and since we are, and I'm not talking about rehab today, one of our long-term goals for most of our patients is getting out of their wheelchairs again if possible.

[00:07:59] If you have contractures that are affecting especially your lower extremities. They will prevent you from reaching that goal. So, you also make sure that all your joints keep the same range of motion that you can actually achieve those goals of walking long term. The most important thing to do, as I said earlier, is stretching. So, people ask me how often should I stretch and I would say any time you can think about this.

[00:08:07] So at least two or three times a day, if you can do it on your own, it's great. If you need caregivers can help you with, you should definitely use that. You can go from simple approaches, like for example, calf stretches that you can, if you can stand, you can use your doorframe, put your toe next to it and then stretch your calves. if you're looking for more detailed ideas how to stretch, Google is a great place to be -- Google and YouTube.

[00:09:00] So any muscle, you can think of. There's some video somewhere that tells you how to stretch that muscle. Exercise itself is really important and endurance training. But overall, as spasticity becomes a little more involved, we are actually trying to use all kinds of approaches from a rehabilitation approach to oral medications, we're going to talk about this in a second, to some local treatments, and in the most severe cases, surgical treatments might be involved. So, when we talk about all medications, you see the three most commonly used ones, actually top two are the most commonly used ones.

[00:09:42] So one is called baclofen, which is a pill that you take usually, about three times a day. The second one is Tizanidine or Zanaflex which you will also be taking a couple of times a day. And then in the more rare cases we might use Dantrolene. But what all of these drugs have in common, they cause severe foginess, cloudiness, sort of mental depression which is usually hard part for most people to get used to.

[00:10:14] In general, over time, if you start these medications, we start them slowly so that you can get used to it. And many people over time who were using these medications will get rid of that foginess, but never really completely. So, when we start treating with oral medications, again, the first question is, do we need to treat and if we have to treat, we're going to try to use the lowest possible dose. One other reason why we're going to use the lowest possible dose is we did several years ago we did a couple of clinical or preclinical studies in the laboratory that showed using some of these medications might get in the way of neural repair. But it doesn't mean that we don't use them.

[00:10:58] We just make sure we use them as little as possible because sometimes I see patients coming to me from the outside that have seen some general neurologists and they just mentioned somewhere they were stiff and they're just – someone just throws baclofen on them and I say, did you really need it? And usually in most cases the answer is no. So, if you use it, use it as sparingly as possible.

[00:11:21] But these are medications, once you take them, you have to take them on a regular basis. So, they're not something like a Tylenol. These are medications you have to build levels to. The other thing is from a rehabilitation standpoint, physical therapy, very important, occupational therapy, speech therapy, if spasticity, for example involves the voice, which is a possibility. At our centers in Baltimore, we've been using activity-based rehabilitation.

[00:11:48] So combining traditional physical therapy and occupational therapy with a functional electrical stimulation tends to be a very powerful approach of getting people at least to lower doses of spasticity medications and some people even coming off. And that got published actually more than 10 years ago, 15 years ago. So, it's definitely working then when we talk about local treatments.

[00:12:10] So now we're going away from systemic treatments with the oral medications, we can use local treatments where we essentially pick out that one muscle or that group of muscles that seems to be most affected. So, the most commonly known is Botox and that's the same Botox that you would use for migraines or for wrinkles. So, it's essentially injected directly into that overactive muscle.

[00:12:34] And the drug has been out since 1989, and so people who know me, who have been given Botox too, they know my speech on this, they say no, Botox was developed as a biomedical weapon, actually as a weapon of mass destruction. And I think in the 1920's, 1930's so the intention initially was to spray this over cities and kill as many people as possible.

[00:13:03] It turns out that they didn't quite work, because by the time the stuff hit the ground it was inactive. So, in the 1960's, the military turned this over to the doctors and said we can do something with it. And so, then Botox was born essentially in the 1980's. So hence one of the warnings on there is if you use, you can only use so many units of Botox before it could cause some harm.

[00:13:30] So usually, use Botox when it's a limited number of muscles or we have some muscles that are really needing some special attention to. So how does it work? It essentially blocks. So, you see a picture here of muscle fibers, this is the pink stuff. And then you see the sort of black triangular or rectangle shape, one thing connected to those lines is essentially nerve endings and their little intersections with the muscles. When we give Botox, we essentially block those. So, we cut those off. So now the nerve endings that are sending the signals from those party neurons, that are sending all these firing from the spinal cord, can't directly connect with the muscle endings anymore.

[00:14:14] So that means the muscles can't respond to that firing. And so, once we disrupt that with Botox and it takes about three months for it to regrow and make new connections. So hence the effect of Botox generally lasts around three months for muscle, for regular skeletal muscles, if you use it in the bladder, if you use it -- and some other muscles could go up 6-9 months, but generally, we can retreat with Botox every three months. It's a very good treatment and very safe even though when I scared you a little bit with the war analogy here.

[00:14:52] So it has been, if you read that package insert for Botox, it's pages and pages and pages, because anything that's ever happened since 1989 is written down in there. So, yeah, so the more -- if you had more

severe cases or if we had more muscles involved or if the oral medications don't work quite well, we have intrathecal spasticity management.

[00:15:16] So it's an intrathecal baclofen pump or ITB pump. You see the picture there. That's essentially injecting baclofen straight next to areas of where the spinal cord is with a little catheter. So, the pump itself is hidden underneath your skin, usually in the belly. And it's this tiny little catheter, feels like an angel hair spaghetti underneath the skin. It gets inserted right next to the spinal cord and then it will trickle out very slowly baclofen.

[00:15:45] So the same oral baclofen that we use by mouth and now you do it next to the spinal cord. The beauty about intrathecal baclofen is that it only goes where it's needed to be, because as you said you want to calm down those party neurons. so it goes right next to the spinal cord. And by doing so we need about a thousand times less of baclofen than we would take by mouth.

[00:16:09] So you get all these systemic side effects of the mental foggy and cloudiness. That is generally not a problem. You see the picture here where it kind of gets inserted, you can program these pumps through your skin. So, it's a wireless connector that we just hold over the body.

[00:16:29] And we can say how fast this medication has to come out, is there certain times of the day we need more or sometimes of the day we need less. All this can be done. We can read how long the pumps last. Usually, a pump lasts about seven years and then it has to be replaced.

[00:16:44] There are centers virtually all over the United States actually over the world that can do that. So even you're free to travel. We have to refill these pumps at least twice a year. So, to refill them, we use a little needle and stick it into the catheter in the center of the pump. You see the little indentation there. But they're working extremely well. And the only thing that we always make sure is that we have a patient who is compliant.

[00:17:10] So if you're a patient who usually does what your doctor tells you, then you're a great patient for that. If you're generally doing whatever you want and you never show up to your follow up appointments is not your medication, because we don't want these pumps to run dry, because if they run dry, if they're empty out and you don't refill them in time, then you could get severe withdrawal symptoms, which essentially can be pretty bad.

[00:17:37] So we don't want to see that, but you get to get a good team involved that does it all the time. Super safe. You can have essentially no activity restrictions you can work with. The last resort of spasticity, so if all these fail, are there are some patients where this can happen, luckily in the last couple years we see this less and less and less and less, there are surgical treatments.

[00:18:00] So if you can't do it by mouth, if you can't do it with Botox, if you can't do it with intrathecal then you could use surgery. And the surgery approach is usually an irreversible approach. We would either cut the nerves as they go into the particular limb. You can cut the tendons themselves to open this up again.

[00:18:21] So this is essentially the last resort that we don't really want to get to if at all possible. So that's why when I say we try to see in our clinics to the early signs of spasticity or contractures as soon as possible, because we can prevent those with aggressive stretching or even some medications, so that we never have to get to the point of surgical interventions for that. And what's the most effective one of all of them? Now, what's the favorite answer in neurology?

[00:18:54] It depends. But in general, it's a combination approach from rehabilitation, some oral medications, consider some local treatments, and really in a very last resort, we might use some surgical interventions for spasticity, but ultimately you want to do this under the guidance of a physician who is experienced in treating spasticity.

[00:19:17] That does not have to be a physician, it could be a nurse practitioner, Janet over there, I'm sorry. So, any advanced practitioner who is versed in treating patients with spasticity should oversee that. And it also should be one in the hands of one physician or one clinician, because if there are too many cooks in the kitchen it doesn't really work well, so similar to similar to pain management.

[00:19:40] And so if we summarize this up, so spasticity is extremely common. The reason is those party neurons in the spinal cord that have lost the calming voice that comes from the brain.

[00:19:50] And if we all put our hands together and our efforts together between rehabilitation and some oral medications, maybe some injectable medications, and the biggest part is actually you as the person involved, because all this stuff that happens at home, for example, the stretching.

[00:20:10] Now, we can only tell you we can't do it for you. So, you do it yourself or get your team involved to prevent this from happening. We don't have the medication yet to make it completely go away, right, because spasticity is really only a symptom of the nervous system injury. Until we can actually fix nervous system injuries themselves, we will not be able to make it go away, but we can make it a lot better. And make sure you see an expert who's very versed in treating that condition. Questions? Yes, we may need a microphone. Does anybody have one?

Audience Member: [00:21:02] Good? Yeah. So, in regard to baclofen, and I know you were talking about the side effects. With long term use, those potential side effects like fatigue, confusion, things like that, do they potentially get worse or is it stable over the course of however long you use the baclofen?

Dr. Daniel Becker: [00:21:22] So generally over time the use of oral baclofen, the side effects get less. If they get worse, there's something else going on. So usually, the longer you're on the less of the side effects people have and some of them it never really goes away, but it doesn't really get worse over time, it usually gets better.

Dr. Benjamin Greenberg: [00:21:46] And I believe there are a couple online questions.

Dr. Daniel Becker: [00:21:52] I think there's more and more over there. Did I see a hand? Yeah.

Audience Member: [00:21:58] Yes. Hello. For the aging adult that has, let's say spinal stenosis, degenerative disc disease, and a lot of disc bulges. How do you differentiate whether that patient is being affected by spasticity versus just the aging process?

Dr. Daniel Becker: [00:22:21] It's really hard. So generally, I like seeing my patients for a very long period of time, because we age together so that I can see how did you look two years ago, five years ago, 10 years ago. When I see somebody new, it's hard to tell, because as we get older, stiffness or generalized spasticity tends to take place. Anybody who you talk to, my old parents and grandparents and they always say, oh my God, I'm stiff and I know they don't have any -- at least to my knowledge, any pre-existing strokes or central nervous system injuries.

[00:22:53] So it's still there. But I think the same principles apply. I mean, you still have to make him physically active, use a lot of stretching. And so, then it really becomes more of a semantic question. Is this, what is

it from? The only important thing is, you want to make sure if somebody starts developing spasticity down the road that somebody actually looks, there's nothing else going on.

[00:23:14] For example, if you have bulging discs in the spine, could any of these discs actually be pushing on the spinal cord that could potentially cause spinal cord injury and adverse spasticity? But other than that, if all this is removed and it would be safe to assume, just use the same principles of spasticity treatment for them.

Audience Member: [00:23:34] Okay, thank you. One last part, do you ever use a spinal stimulator for folks that are really struggling? I know of a patient who has tried that and I'm just wondering how often and when do you actually provide that type of treatment?

Dr. Daniel Becker: [00:23:50] So there are, so I'm not sure how familiar people are with spinal cord stimulators. So, they're called epidural stimulators. They have become a lot fancier over the last 5-6 years, because they used to require the big surgery where you open up the spinal column and then put the stimulator paddles right next to the spinal cord. Nowadays you have epidural stimulators that we use a wire electrode that is essentially placed as an outpatient right next to the spinal cord and can be programmed.

[00:24:20] The only indication currently in the United States for epidural stimulators is for management of pain. I have maybe 10 patients in my office who have epidural stimulators. They work very well for pain. I have not seen much of an effect of an epidural stimulator on spasticity. I would, I don't see that. It's usually for pain management.

Audience Member: [00:24:44] Thank you very much for being here.

Dr. Daniel Becker: [00:24:46] You're welcome. Thank you for having me.

Dr. Benjamin Greenberg: [00:24:49] Okay, so we only have time for two more, so we'll take two online questions.

Audience Member: [00:24:55] So question for Dr. Becker, what can you suggest for a left facial paralysis? I had herpes zoster three years ago due to adverse effects of rituximab. What can you suggest to return to normal? I still have a feeling of rubber hand on my left face just doing self-exercise. Thank you for answering my question

Dr. Daniel Becker: [00:25:11] Left facial paralysis. You're changing the topic here, I mean. so left. So, if people have Bell's palsy which is essentially an injury to the nerve that innervates the motor function of your face. And they can -- most of them have an incomplete recovery, actually I have a family member who has that, who used to be a professional tuba player for the St. Louis symphony and then had to lose that profession because he couldn't do it anymore.

[00:25:38] There is some experimental evidence that if you were to use electrical stimulation to the muscles of the face that are affected that can help with some recovery. But in general, recovery is incomplete.

Dr. Benjamin Greenberg: [00:25:53] There is one other option to look into. And there are some surgeons who will do a nerve transfer where they'll take a piece of nerve from the functioning side of the face, move it to the other and try and bring back some symmetric movement. It depends on how long ago the injury occurred.

Dr. Daniel Becker: [00:26:11] You said there was a second question?

Audience Member: [00:26:13] Yeah. And then is there a relationship between spasticity and atrophy?

Dr. Daniel Becker: [00:26:18] So is there a relationship between spasticity and atrophy? So, if you have an injury to the central nervous system. So, the nerves that innervate the limbs, if they get cut, for example that muscle that loses its input may shrink in size. So that's called atrophy. At the same time, because of the injury to the central nervous system. You can actually become spastic in the same muscle as well.

[00:26:44] So definitely there is a link. What we see generally if there is more of spasticity in that muscle, the muscles shrink less than people who don't have spasticity. So one of the prognostic markers that we sometimes look, especially in acute spinal cord injury patterns is if we see some spasticity, it's more a good sign, because it means that there is some intact neural circuitry versus if it's all flaccid, and we talked about this before, then the circuitry is much more affected and may have a less adverse prognostic outlook, but definitely there is a link because I think the reason for both of them is the same. Thank you for having me.