BroadcastMed | mac_8674_spastic-broadband-high-1080p.mp4

BILLIE SCHULTZ: I'm Billie Schultz. Dr. Wainberg is also helping do this presentation, so we're going to be talking about the practical evaluation and management of the spastic patient. A big thank you to Sarah Boyd, Ashley Jones, and Lisa Beck who all contributed slides to this presentation, so a big thanks to everybody.

We are going to discuss some off-label usage of medications, pretty common in the PMR world, but that happens. We are going to be primarily looking at the adult patient. So just as a reminder, a lot of the botulinum toxins are off-label for pediatrics, which we didn't really comment much on that. But ask your pediatric colleagues if you want to know more details.

We're hoping that by the end of this presentation, we'll be able to identify clinical and objective measures that we use to assess the spastic patient, as well as medical and rehabilitation interventions that we use to manage the spastic patient.

The primary thing that we want to-- what we really want to show is why this is a multi-disciplinary approach to spasticity management. It's not just one person, it's usually a team of people, including the patient and their family members, to manage the spastic patient.

So We're going to set this all up following one patient through their history. So we have a 56-year-old female who was referred to you as the PM&R provider or therapist for right leg pain and the setting of multiple sclerosis. So they're actually showing up in a musculoskeletal clinic because they have leg pain. And this is just to show you that it's not always coming from a neuro practice.

So this patient has a two to seven out of 10 character of this achy pain that's been going on in the right calf and foot, and it's been going on for months. It's worse when she's tired, or if she's been walking long periods of time, and her husband describes her walking as funny, and says she's been tripping and almost falling a lot more frequently. And so, you go back and look at her medical history, and she was actually diagnosed with multiple sclerosis about two years ago in the setting of some right lower extremity weakness. Reportedly, this resolved. She did not require any sort of ongoing therapy, bracing, gait aids, and she just had this mild weakness.

She continues on typical treatment for her multiple sclerosis and is followed by neurology, and I didn't get into any of those treatment things because that's not the focus of this. So you actually see her. You examine her, and you're like, wow. She really has this kind of spastic gait appearing, with a little bit of circumvection of the right lower extremity, a little bit of equiovarus positioning in the swing phase.

She's kind of scuffing her toe as she's walking, as she's swinging through. You look at her shoes and her shoes are about a year old, and kind of the anterolateral toe is kind of scuffed up. Her strength is pretty normal, with the exception of her ankle dorsiflexion and EHL which are minus one, but you see an increase in muscle tone and increase in reflexes.

So the first thing we want to talk about, as we say, increase of muscle tone, and how can you actually assess or describe what you mean by increase in muscle tone. So there are a couple different scales and a couple different tools. And we're not going to go through them all in exquisite detail, although they're all included here, and you can go back and review. But I think the most important thing is to clarify what tool you're using and make sure that your institution has some familiarity with whatever tool it is. Because it might not be you that's following them up. It might be the therapist you're working with, another colleague that you're working with. And so you want to be able to see, are things getting better or worse depending on your intervention?

So it's not just a tool to describe how the patient is now, but also a tool, did our interventions help, or did they hurt, or did the disease progress, or did it get better with whatever treatment the neurologists are doing?

So probably the most common tool is the Ashworth, and now the modified Ashworth. The modified Ashworth just added in a 1+, and so that's probably the most common tool. No increase in tone would be a zero, limb rigid would be a 4, and everything in between. And so, that's easy enough to remember if you remember the top and the bottom, and then kind of figure it out from there. It's probably the best way to do that. And again, it's all highlighted here.

The Tardieu Scale is another one that's used relatively frequently around the country. We do not use it as much here at Mayo Clinic, but basically, you're looking at the angles and then where you actually are feeling the muscle reaction to that. So if you have-- where you're feeling that dynamic tone and in kicking in, and so both slow stretch, fast stretch, and then the dynamic tone component of that.

There are other tools that are used, and so you can actually use functional measures. You can use coordination measures. There are self-reported measures like the Penn Spasm Frequency Scale that we see used quite a bit for our patients with spinal cord injury who get more spasms as opposed to spasticity. There are actually electrophysiologic measures. They're doing a lot with muscle elastography, trying to see if they can quantify, in a little bit more objective manner, how spastic, or how tight the patient is.

And just as a reminder, spasticity is not the same as rigidity, or is not the same as just being tight or having pain. Spasticity is a neurologically-mediated increase in muscle tone that is velocity-dependent.

So you see this case, and you say, "You know what? Your pain is actually due to your spasticity, I think." So you have a spastic right lower extremity that is sporadic in the setting of your multiple sclerosis. So what should we do about that? Well, the first time you see them, you're like, "You know, you're actually getting around pretty well. You're not falling, so let's start with a more conservative approach for management." So the plan is for some patient education, for physical therapy, and then potentially to review the role for bracing.

So patient education, first thing to do is, why do you have spasticity? You know, a lot of our patients, we just tell them you have this diagnosis, and a lot of times, they want to know a little bit more. And so there is a mechanism underlying spasticity. And basically, it's really an imbalance between the inhibition and the excitation of the anterior horn cell. So, in a normal muscle, these things balance. But if we have decreased inhibition, we have more excitation, we get spasticity.

So simple terms, if you have spasticity that's a brain origin, so our patients with brain injury, with cerebral palsy, with strokes, and some with multiple sclerosis, the inhibitory signals aren't actually being sent down, and so you have that excitation without inhibition, and you get spasticity. If you have spasticity that's more spinal origin, again, multiple sclerosis in some cases, spinal cord injury, the inhibitory signals are being sent down by the brain, but they're not being received by the spinal cord, because that's where the break in the system is.

Spasticity can be good, and so there are a lot of functional benefits of spasticity. For a lot of our patients, they use their spasticity to help with transfers, with ambulation, with getting around. It can actually help maintain bone mass and decreased risk of osteoporosis, muscle mass. It can potentially decrease our DVT risk. And for some of our patients, depending on where their spasticity is, it can decrease the risk of pressure, also, for ulcer formation period.

Additionally, our patients sometimes can't perceive sensory stimuli, or painful stimuli. And so changing in spasticity can tell us something's happening. So, for instance, a spinal cord injury patient who is developing a UTI might actually, their spasticity, and their increase in spasticity might be the only clue that we have that we need to treat a UTI. And so it can actually be a sign that we need to look for another medical problem going on, because they're not going to feel some of those other things.

It can also be bad. So for some of our patients with spasticity, they have more problems with impairments. They're having problems with sleep and fatigue and joint contractures and pressure ulcers and hygiene issues. For some people it's problems with seating, completing their ADLs, working, and the caregiver burden that's associated with that.

So as we're thinking about treating spasticity, we really need to look at goals of treatment. We don't want to treat it if there really are no goals, or if you and the patient's goals don't necessarily agree. If the patient schools are, if we treat the spasticity I will walk normally, and your goals are not that. If your goals are more of a hygiene thing, then you really need to come together on what those goals are, or you're going to have a disappointed provider and disappointed patient. So goals can be pain relief, goals can be changing and improving ambulation, they can be facilitating hygiene, but every patient's going to have an individualized goal that you need to take into consideration.

Again, when you bring the patient back and you're like, "Did this help or did this not?" We want to know, did it help meet the goals that we had set at our previous appointment?

So most of us have seen the spasticity pyramid. There are a lot of different organizational strategies for spasticity. There's a four square model that looks at this as a focal treatment, a systemic treatment, a permanent or irreversible treatment. There is the pyramid model where you kind of build your way up. There's this Easter basket model, where you pick something out of the basket, whatever you think the patient needs from a management standpoint.

We're going to base this presentation a little bit off the pyramid model. But if you look, and if you looked at the patient educational material that we provide on spasticity management, you'll know that oral medications and the chemodenervation and neurolysis options are actually oral medications with the chemodenervation on top of that. And we have put this side by side, because depending on the patient, we might jump to one or the other.

So from a physical therapy standpoint, this is kind of our stretching, bracing and positioning. So there are multiple therapeutic interventions out there they'll still use. They'll look at stretching, and we have another slide on that. Weight bearing can actually be really helpful for some of the lower extremity and upper extremity spasticity management. Serial casting and splinting, so a lot of times we'll do this in combination with another treatment, or sometimes alone. And it's more used in our pediatric population.

Locomotor training, and there's actually some really good research looking at functional electrical stimulation, locum at use, and how that can affect spasticity and improve spasticity management. Actually positioning of the patient to avoid any contractures, E-stim, different techniques and modalities that the therapists use that actually work to inhibit those spastic patterns, versus facilitate those spastic patterns. So looking at Grundstrom versus Bobath and the differences between those two techniques, and then strengthening those muscles that are working against the spasticity.

From a stretching standpoint, our goal is to increase the muscle length, the motility of the joint. We want the patient to really stay active, and this should be something that they do daily. So I really stress to my patients the importance of stretching these muscles on a daily basis. One time once a week is not going to be helpful for the patients. A lot of the times, the muscles that I tell them to focus on are the muscles that tend to be tight, the hamstrings, the heel cords, the hand and the wrist muscles, the hip flexors, muscles that are going to help maintain an upright posture, and then muscles that are going to help with function in the upper extremities.

We also sometimes will use bracing, and we didn't include that in here, but in this case, sometimes it can help with the spasticity, but sometimes it would just be a functional thing to decreased risk of falls, to improve gait efficiency, and gait efficiency as well as allow the patient to independently ambulate.

So when we're going back to our patient, we've talked about the goals. Her goals are going to be, "I want to walk safely, and I want to minimize the risk of contracture," after we talk to her. So she started stretching daily, and using an AFO, and she's doing great. She comes back to see you for a one-year follow-up, but her spasticity has worsened. And what you specifically notice is that now she's having problems fitting into her AFO. And actually, she's developing pressure wounds at the kind of the strap sites of her AFO, because she keeps on trying to pop into a little bit more plantar flexion.

So you examine her. Similar, except now she-- not just a toe striking as she's doing kind of coming into the swing, but she actually can't get her foot down flat. She can't get her heel down into the AFO. Her DTR and reflexes now are plus four and they were plus two before. She has sustained clonus, and now we're saying she has a modified Ashworth of four at the right ankle. So she's significantly worsened in specificity, and she's more weak than what she was before.

So if you remember earlier, her ankle dorsiflexion, and the EHL were minus one, so her weakness is progressing.

So we're going to move up a little bit here. So we're going to talk a little bit about oral medications. Just reminder, there are multiple, multiple, multiple medications that have been discussed. Some of these are more anecdotal information, some are a little bit more high-quality information, but there are really only four medications at this point that are FDA-approved for spasticity management. We have a lot of detail on these slides. We're going to go over them relatively briefly, again, knowing that you'll be able to review this if you need to.

So first thing to keep in mind is a lot of our patients are of child-bearing age, and so we did include it in here, lactation risk and pregnancy categories. I know this has come up with my patients in the past. "Can I still take this medication? Can I still do these injections, given that I'm pregnant, or I am breastfeeding?" So just as a reminder of the pregnancy categories, A, no risk. X, contraindicated, and things in between, including no evidence of risk or can't be ruled out. Lactation, L1 is the safest, L5 is contraindicated.

So Baclofen is probably the most commonly used medication that works as a GABA-B receptor agonist. It's primarily used for spinal cord injury and multiple sclerosis, but we'll see it used very frequently in cerebral palsy, stroke, traumatic brain injury. There's some evidence that it might not be effective in those groups of patients. You can start, again, most of these medications we recommend starting low and going slow. So start a relatively low dose, and slowly increase it, because usually it's better-tolerated that way. The side effect of sedation is probably the reason patients want to discontinue this medication. That's probably the biggest limiting factor we have in continuing the medication.

But, some unique side effects of this medication are it can lower the seizure threshold, and it can cause hyperglycemia, which we'll sometimes see with our patient. There's no monitoring required for the medication, but sudden withdrawal can cause seizures and death, and so it is important if you have a patient on a higher dose, or intrathecal back with him, which we'll discuss later, that is actually weaned off for the patient.

Pregnancy category C, which basically means we're not entirely sure how this is going to affect pregnancy, and from a lactation risk standpoint, there are Australian guidelines that say that this might be safe.

Dantrolene is what we-- and this is the board answer. If you have a patient with a traumatic brain injury or a stroke who has cognitive deficits, and you want to treat their spasticity, this is always the answer. The reason for it, is it's peripherally acting. So this is really affecting calcium release at the sarcoplasm reticulum within the muscle. And so in theory, it shouldn't cause any sedation or cognitive side effects. Anecdotally, I've had patients complain of that, so-- but usually, the complaints I get from patients are more GI symptoms. It can act slightly on the smooth muscles, as well as the skeletal muscles, and so sometimes patients will complain of worsening GERD symptoms, or problems with diarrhea or constipation.

Again, this is a little bit different in that it has a very standard. You start 25 milligrams a day for seven days, and then 25 milligrams three times a day for seven days, and then increase, a lot different than what the others, which don't have those specific guidelines in their package inserts.

You do need to monitor LFTs on here, and if you look at the package insert, it just says monitor closely. And so it's really up to the physician how you define closely. I know I take a very conservative approach. I know other people don't. But, in 1.8%, it does cause hepatotoxicity. It tends to be more likely to be hepatotoxic at higher dosing and with women. And so, I warn people about this and if I do see it trending up in the LFTs, I usually discontinue the medication. Again, pregnancy category C, and it is contraindicated if the patient is nursing.

Diazepam works more at the GABA-A receptor. Again, start low, go slow. Sedation, memory impairment is the biggest side effect, so we don't like to use it for our brain-injured patients who have underlying cognitive side effects. Pregnancy category D, which is not good. Lactation L3, L4-ish, so use it carefully.

Tizanidine is the last of the FDA-approved medications. This is one I probably see used most often in multiple sclerosis, spinal cord injury. It's centrally acting alpha2-agonist, and the primary side effects are sedation, but the unique side effects for this are dry mouth and hypotension. So if you have a patient who's already at risk of orthostasis and passing out on you or getting lightheaded, you want to be cautious with this medication. Again, that's your spinal cord injury patient, so you just need to keep an eye out for that.

Pregnancy category C, and lactation risk, we don't really know. The other thing to know is that there are actual contraindications if it's used in combination with a CYP1A2 inhibitor like ciprofloxacin, Cipro.

Cyproheptadine is off-label. The unique thing about this is that it's actually, from a pregnancy risk standpoint, is a B, which is probably the best you're going to see for any of these medications. There have been studies in spinal cord injury and multiple sclerosis, and you can start lower dose, probably less side effects of sedation, dry mouth that I've seen. The bradycardia is a little bit unique, and the dizziness. And, it has been shown to improve walking speed, which none of these others really have been shown to affect function. They're more looking at spasms than tone, so that's a unique aspect of it, and generally pretty well tolerated by patients that have used it.

So I'm going to pass off to Dr. Weinberg, and he's going to finish up right here.

MICHAEL WAINBERG: OK, great. Thanks. Now the last study that we're showing here related to oral medications is a fairly new study. It just came out about a month or so ago, and it's very interesting, because what they looked at was trying to determine whether there would be patients who used anti-spasticity medications, if there were benefits clearly, or whether there was potentially some adverse effects over time.

And so, it was retrospective analysis that was done. They had about 1,200 patients in the study, and about half of them, give or take, had been exposed to some antispasticity medication, at least what they were calling an antispasticity medication, because they also happened to include medications like cyclobenzaprine, metaxalone, methocarbiamol, and carisoprodol, pro-wall which I'm not sure we would necessarily consider them to be mainstream meds that we would use for spastic patients.

And interestingly enough, they did a very elegant statistical analysis on this. And it suggests a relationship between the use of these medications and a decreased motor FIM score at discharge. They did not find that this change was present after one year after discharge. They recognize that there were certain limitations in the study, and while I don't think there's anything we can strongly hang our hats on with this, I think it's important to recognize that anything that we're doing with our patients, even something that we consider to be pretty standard or mainstream as anti-spasticity medications have potential adverse effects on them.

So we're going to go onto focal treatment options. When we're talking about the oral medications options, those are more systemic interventions. So probably the older, better, longer-lasting treatment that we have has been chemoneurolysis, primarily with phenol, though alcohol also is an option, and pros and cons of when we're looking at focal treatments. Well, focal treatments such as, I guess, probably just a back-up, a second to say also that we oftentimes will have patients that we have very diffuse problem with spasticity. Sometimes it's a much more focal problem within their body areas. And so then we have to make the decision, which is the way that we feel we're going to best serve the patient and help them achieve whatever their functional goals are.

So if you do make the decision to go with a focal treatment, then one of the options is phenol. Now in our practice here, in the adult population, we tend to do it fairly rarely. In my previous practice, it was a more frequent go-to option in very selected patients. With medications like phenol, for example, one of the nice things is, when we administer the medication, we see the effect of the medication virtually right away. It lasts much longer, on the order of 12 to 18 months or longer, in certain-- some patients. And to use the dirty word also, cost-wise, it is a lower-cost medication.

It tends to be less selective, unfortunately, and basically, the mechanism is by chemoneurolysis, so we're destroying tissue. There is a potential for chronic pain or dysesthesias, especially with the nerve blocks, and we always try to remember to tell the patients up-front, that if that does happen, the treatment is going to be to actually repeat the block to try and complete the neurolysis. And it's much better to tell them that up-front, rather than once they've had the side effect and then, it's hard to keep them enlisted in the care.

So really, there are two main techniques that we've used for use of phenol. One is the motor nerve block, which again, you're selecting, most commonly a nerve such as the musculocutaneous, or the obturator nerves, and injecting peridurally with the phenol.

In comparison, motor point block, in some places you'll see that-- call that a more difficult procedure, and I might tend to disagree with that a little bit. A lot of ways, the technique is fairly similar to what we might consider doing with neural toxins, and so from that perspective, I find it actually an easier technique. What I really also like very much about it is, is that you can grade the response because you're able to do it and see the response, and do it and see the response within minutes, usually.

Probably the more frequently-used, certainly in our practice here, is the neurotoxins, the botulinum toxins. They work by impeding presynaptic aceylcholine release. They start working a few days after the procedure, reach their peak somewhere between two and four weeks afterwards, and last variably somewhere between two and six months, typically in the three to four-month range. One of the things that you'll read in all the package inserts, and obviously, clinically, a consideration, is that these are not interchangeable dosing-wise. And so, there's nothing to say that X number of units of one medication will convert into X units of a different medication.

We have four types available, the Botox, or onabotulinumtoxinA, has, and what I've listed here are what the FDA indications are there, with relationship to spasticity. They have several other indications as well, but regarding spasticity, Botox has a proven spasticity indication in adults, and they specifically identify those muscle groups.

Dysport, or abo, also has an upper limb spasticity indication, as well as a pediatric, but we'll defer that to our pediatric colleagues. Myobloc actually does not have a spasticity indication that I'm aware of, whereas Xeomin does, again for upper limb spasticity in adults. They list out several different muscles. In practicality, clinically, we don't typically limit ourselves just to go whatever the FDA muscle-- approved muscles are, but just for your information as to what's out there in the FDA-approved realm.

Pros and cons. Well, again, it's a very nicely reversible treatment. That's both a pro and a con. It's minimally-invasive. We have a good, nice way to titrate the dosing. One of the biggest concerns that we have is the development of antibodies. Now that tended to be a lot more of an issue earlier on when there were higher protein loads in the medications, and, in particular, when we would fairly routinely give booster injections along the way. In my practice, we had not done injections any closer than two-month intervals, and generally try and stay at least to the three month or more when possible.

So, regarding our patient, because she's had focal spasticity, we decide to treat her with neurotoxin injections, and she does well, and she continues to do well for a year or more. But then she's progressed, unfortunately. Now, she has spasticity and weakness involving all the muscles of her lower extremities. Her ambulation is impaired, and she's having falls frequently.

On her examination, she's maximal assist to transfer, she can't advance the lower extremities, her tone is three to four throughout the lower extremities, so basically we're getting to a virtually rigid extremity. Her deep tendon reflexes are blunted. She has sustained clonus. There's more weakness, especially distally.

And so now, we're kind of moving our way up our pyramid again. And the next option that we may want to discuss with her is the option of intrathecal baclofen. Now, how do we choose which patients are the greatest candidates? Well, we're looking for, typically, patients who have pretty significant specificity that really have not responded to prior conservative interventions of the different medications, whether it's because we couldn't get the effects, or because there were adverse side effects that precluded further treatment.

And one of the other issues is also complexity and compliance, meaning, this is in comparison to having the patient simply take a pill X number of times a day, or having a caregiver administer a pill several times a day. Now they have to return frequently-- they have to return periodically, excuse me, for having pump refills. And they also have to have access to an emergency medical care system that if they should experience some pump malfunctions, that their local system can manage that for them.

Benefits of the intrathecal dosing is that it's a much lower dose. It's delivered to a target site, in comparison to the oral medications which is a much larger dose, and some does get through the blood-brain barrier, but not to the same degree. And so typically, the systemic side effects are much less with the intrathecal baclofen.

How our process here at Mayo is, is that if the patient is deemed to be a responder to a test dosing, then we go ahead to proceed with the transition to pump implantation. The test dosing they're assessed prior to the test dose, and then the test dose, which is either 50, 75, or 100 microgram dosing. And then what ends up happening, is they are assessed both before and after on standardized measurements.

And some very nice results have been had for those patients. And the starting dose is typically based on their response to whatever their test dose was. And kind of for interest of time, I'm going to skip forward here just a little bit. Again, you'll have that as a reference.

So our patient's been reading about other options, and one of the things she's been looking into is medical cannabis. And so cannabis is FDA-approved. There are FDA-approved cannabinoid medications. There are three right now. There's Marinol, or dronabinol, which is a synthetic delta-9 THC. The package insert indications do not-- are not related to spasticity. There is AIDS-related anorexia, refractory cancer chemotherapy induced nausea, CINV. The pharmacology, it's always very interesting to read the package inserts, because when they-- and this is quoted, "complex effects on the central nervous system," which effectively means we're not quite sure how it's working.

Interestingly enough, and this, I wasn't aware of this until I spent time reading through, is that only about 10% to 20% of the dose that's taken orally actually ever reaches systemic circulation, because of empatic metabolism on first pass.

A second agent is Syndros, which is basically a liquefied dronabinol. And then, there's a third agent, Cesamet, which is also a synthetic. These are all synthetics, by the way, and with a similar indication. So again, as far as the FDA is concerned, there are no cannabinoids that are appropriate for use in spasticity.

One of the studies that gets quoted quite a bit, I like this study because it's a fairly straightforward type of design, a double blind, placebo controlled crossover study, and with a medication administration pattern that would probably more closely represent our patients. Mainly, they smoked cannabis daily, for three days. These were cigarettes, cannabis cigarettes that were actually produced specifically for the study. And they had 37 patients who enrolled, and only 30 that completed the study.

The primary outcome was their modified Ashworth score. Actually, what they did was, they did a composite score, putting the bilateral hip, knee and elbow, and then, so basically, what that did was give a maximal score of 30. And they assessed the patients before and after. And again, it was a blind assay. They a, I believe it was an 11-day window, washout period. And their modified Ashworth score dropped by 2.74, but looking at the p level, that's a fairly impressive p-level response.

They had secondary outcomes also. Pain scores, Visual Analogue Score, again, a fairly impressive p level. Interestingly enough, their timed walk didn't change. And then, they administered a cognitive test also. And the cognitive test had a decrease with use of cannabis, compared to placebo. So again, probably not entirely surprising, but it's nice to see this was done in a fairly nice design.

Now the American Academy of Neurology came out with a review, a review of reviews, as they called it. And they looked at a couple of different areas that I think are very, very interesting to us. First of all, oral cannabis extracts, they felt were effective for spasticity. Nabiximols, which is available in European countries under the brand name of Sativex, and also THC, were probably effective for reducing patient-centered measures. For central pain or painful spasms, again, the oral cannabis extract was felt to be effective, and THC and nabiximols were probably effective.

And then they also looked at urinary dysfunction. There were other measures that they looked at, but with regards to those pertinent to our spasticity patients. So interestingly enough, there is some data out there that suggests that our patients can benefit from this.

And in Minnesota, we are a medical cannabis state. And there are, I believe it's-- there are eight dispensaries in the state, and there are-- they have specific indications for patients who can qualify for medically-necessary treatment. And one of the indications is, painful muscle spasms such as may be seen in multiple sclerosis. There's also chronic pain indication as well, as well as seizure disorders and others.

But with that, well, thank you for your time. And we'd certainly be happy to answer any questions.

BILLIE SCHULTZ: Before we take questions, I just want to put in a plug. We didn't talk about surgical intervention, but in about a month, one of our surgery colleagues is coming to talk about upper extremity spastic and paretic limbs, and potential surgical intervention for that, so come.

AUDIENCE: When you're doing phenol motor point blocks, what percentage of phenol are you using? And does the tissue turn into like gritty sandpaper after repetitive injection?

MICHAEL WAINBERG: In-- the literature varies in its numbers. I typically use 5%, and that's not-- doesn't seem to be associated with significant pain in some of the patients that we've done the injections every two years or so, and have done them for three or four times. It really didn't seem to be an issue of injection pain, or necessarily change in tissue texture.

AUDIENCE: I'm just curious why phenol hasn't caught on more. Marketing, I can understand.

BILLIE SCHULTZ: It doesn't have the broad-- yeah, I was going to say, it's marketing.

MICHAEL WAINBERG: And the point is, is that it's kind of an older technology, so to speak, which, you know, there are many of us who were never trained in it. And so, it's really more an issue of where is it still accessible? I think the people who use it are very pleased with it, because I think that it has a very definite place. Certainly when we decide that the patient requires some focal treatment, oftentimes they're going to run out of dosing, so to speak, with neurotoxins. And so, that's a great situation, especially if you're going after very large muscle groups, and again, with pre-defined therapeutic goals for the treatment.

Other questions? Thank you.

AUDIENCE: Billie, great information. Which-- do you use Dantrolene the most, then, or what's your path?

BILLIE SCHULTZ: I still usually probably use Baclofen more. So I use it in the outpatient setting a little bit more, Dantrolene, than I do inpatient. And I'll only use Dantrolene if they're local and I can follow the LFTs myself. Otherwise, I won't prescribe it, and I'll just give recommendations to their local provider. That was me, though.