

Episode 223: The Autonomic Nervous System's Role in Headache and Migraine

Lindsay Weitzel, PhD:

Hello and welcome to HeadWise, the videocast and podcast of the National Headache Foundation. I'm Dr. Lindsay Weitzel. I'm the founder of Migraine Nation, and I have a history of chronic and daily migraine that began at the age of four. Today, we are super lucky to have Dr. Lauren Natbony here. Hello, Dr. Natbony. How are you today?

Lauren Natbony, MD:

Hi. Good. How are you?

Lindsay Weitzel, PhD:

I am great. Thank you for being here. Dr. Natbony is a board-certified neurologist and headache specialist. She is also the founder of Integrative Headache Medicine of New York. She is an assistant clinical professor of neurology in the Division of Headache and Facial Pain at Mount Sinai Icahn School of Medicine. Little bit hard for me to say today, but we're going to move on and I'm going to speak better despite having migraine. Our topic today is the autonomic nervous system, breath, and migraine. This is an important topic, and Dr. Natbony is very good at talking about this. Let's start. Can you please explain to all of us what the autonomic nervous system is, which we often refer to as the ANS and what does it do?

Lauren Natbony, MD:

Great question, fundamental question. So the autonomic nervous system, I look at it as it's working in the background. It controls all of our involuntary functions like our heart rate, our blood pressure, our digestion, how we regulate temperature. So the things that we really are not in immediate control of. So the autonomic nervous system plays a role in everything that we do. And it is really important and linked to headache disorders, especially migraine.

Lindsay Weitzel, PhD:

My mother used to have this saying when she wanted to sort of insult somebody, she'd say, you can't walk and chew gum at the same time. So, this helps you chew your gum while you're walking sort of a thing. Also, it regulates your heart rate, lets you breathe, so that you can introduce people on a podcast and not be focusing on whether or not your heart rate is actually functioning. How is the ANS connected to headache disorders?

Lauren Natbony, MD:

Actually, before I say that, I just want to say a few more things about the autonomic nervous systems. You're talking about the walking and chewing gum. What I usually say to my patients is two main branches, sympathetic and parasympathetic.

Sympathetic is you're being chased by a tiger, you're in a fight or flight. What happens? Your heart rate increases, your blood pressure goes up, you start breathing really heavily, and your body is basically

preparing for stress. But it is sort of this like completely get me out of here, I'm going to die type of situation.

Whereas the parasympathetic nervous system I look it as after a Thanksgiving dinner. We are resting, we are digesting, we're slowing our heart rate down, we're getting our food moving through our body, and we're promoting relaxation and recovery. So, a well-functioning autonomic nervous system keeps that balance. The parasympathetic and the sympathetic are balanced.

When it's dysregulated, that's when it becomes a problem. And that's how it is connected to headache disorders. So, we know that the autonomic nervous system can become dysregulated in headache disorders. And this dysregulation can trigger or worsen migraine attacks.

Lindsay Weitzel, PhD:

What are some signs of autonomic dysfunction in headache patients?

Lauren Natbony, MD:

One of the main ones I see is dizziness, lightheadedness, heart palpitations, or changes in heart rate. People who flush a lot or just sweat a lot. A lot of the digestive issues like constipation, bloating, nausea is an autonomic sign or an autonomic dysfunction, even when that happens during a migraine attack. So, when we have those digestive, the nausea, vomiting, constipation, diarrhea, it all is linked to the autonomic nervous system. So those are the most common signs I see in headache patients. Also fatigue, people are fatigued, but fatigue is our parasympathetic. It's just for resting and digesting too much.

Lindsay Weitzel, PhD:

Oh wow. So, I bet a lot of ears just perked up because you said nausea. You said fatigue. I think everyone's probably listening pretty good right now. So, let's move on. I wanted to ask really quick, because so many of us see our heart rate variability now when we have these devices. Is that related to what we're talking about today and the autonomic nervous system?

Lauren Natbony, MD:

One hundred percent. I feel like these devices should say heart rate variability equals autonomic nervous system. Basically, it is measuring that balance between the sympathetic and the parasympathetic. So, if you have a low heart rate variability, that is often seen in chronic migraine, there's less variability meaning there's increased stress and autonomic imbalance. So, a balanced autonomic nervous system will have a higher heart rate variability.

Lindsay Weitzel, PhD:

My next question is, because you sort of touched on it just now. But we have episodic migraine people in our audience, chronic migraine people, the whole gamut. Is it different? Is the autonomic nervous system more affected for someone with chronic migraine than someone with episodic migraine?

Lauren Natbony, MD:

Yeah actually. And I personally think that the transition from episodic to chronic migraine is also fueled by autonomic dysregulation. Because we know that people with chronic migraine frequently show more autonomic dysfunction, more GI problems, more dizziness with standing, more blood pressure regulation issues, more fatigue. And then insomnia starts. I look at insomnia as our sympathetic and fatigue as our parasympathetic. And all of those sort of circle and snowball and feedback on each other. So yes, it is more common in chronic migraine.

Lindsay Weitzel, PhD:

How do doctors check for autonomic dysfunction in a headache patient?

Lauren Natbony, MD:

Great question. I think like how we check versus are people checking, I feel like two different things.

Lindsay Weitzel, PhD:

Do they check?

Lauren Natbony, MD:

So, I check because I'm clinically interested in it. I think it does make a difference. I guess you could argue how much does it make a difference. In every chronic migraine patient, I think it is something that we should be looking at in patients who present with these autonomic symptoms.

The easiest way to do it in an office is just doing a bedside lay, sit, stand test. Basically, you are taking pulse, blood pressure in a laying and a standing position over ten minutes and checking to see what happens to your heart rate and your blood pressure. So that is the easy way in the office. It just takes time to do it. And that's what I do. The more formal version of that is a tilt table test and basically again, measures the same things just on a machine. There's heart rate variability testing, which we talked about a little bit. There's sudomotor function testing which basically looks at the sweat glands and how the autonomic nervous system works in a different way. So, there are different metrics, but those all need to be done in a lab with specific equipment except the bedside sit to stand, which is pretty simple.

Lindsay Weitzel, PhD:

How does treating autonomic dysfunction help with migraine? Does it help? Do you notice a difference?

Lauren Natbony, MD:

So much of a difference, I feel like the biggest differences I see are on fatigue, brain fog. Again, we're not only looking at pain as a metric because I think a lot of times we think migraine, we're thinking

pain, but pain isn't always the most disabling. Yes, it is disabling, but all of the things that go with it, the nausea, the sleep, sort of just all of it.

So, I find that if you have autonomic dysregulation, meaning the blood from your lower extremities is also not getting up to your brain as quickly as it should, then that's going to be problematic. So, the easiest thing to do is really pushing aggressive hydration and salt intake. I don't want to say this is for everyone, because if you don't have autonomic dysfunction, salt loading is not going to be a good thing.

I know a lot of talk of salt in the media, but I say salt is only for the right patient, not for every patient. But what salt does is, it opens up the blood vessels to allow fluid in, to hydrate and allow blood flow to increase and circulate. So the easiest thing to treat is hydration, electrolytes. I count salt. We basically measure salt, and I put salt strategically in throughout the day

Compression. So compression garments, compression socks, compression hose, compression garments in general again can help squeeze and get that blood flow back up to the brain. One of the best things, and probably the hardest thing is physical therapy and exercise specifically targeted at strengthening the legs and those muscles that are again propelling blood up to the brain. So there are specific exercise protocols that can be helpful. And then there are medications, but those are usually later on.

Lindsay Weitzel, PhD:

How does vagus nerve stimulation help in these situations. And specifically with migraine.

Lauren Natbony, MD:

The vagus nerve is our key player in the parasympathetic nervous system. So that is involved in pain regulation. So, using a vagal nerve stimulator like the noninvasive devices that we have out there basically stimulate, it sounds counterintuitive right, you're stimulating the vagus nerve to reduce migraine frequency and intensity. So, I look at it as a balancer.

It's basically bringing your body back into harmony. Because actually also stimulating the vagus nerve also improves our heart rate variability, our digestion, our sleep. It sort of improves all those background activities that also are comorbid and go into migraine.

Lindsay Weitzel, PhD:

Most of us have been taught certain breathing techniques, whether from a pain psychologist or some other type of educator that's helping us with our pain. Are these aimed at helping our autonomic nervous system?

Lauren Natbony, MD:

Absolutely. I am a terrible breather, so I never knew that I don't know how to breathe. And apparently there's a right way to breathe. So, you want to take deep slow breaths, because that activates our parasympathetic nervous system. And if we're taking these short, staccato- like breaths, it's sort of not doing anything good for our function. So, if we're able to promote relaxation, promote the parasympathetic, it can reduce migraine risk and help in a migraine attacks.

So there's like three different techniques that I like to review. First one, right breathing is diaphragmatic breathing like belly like really taking deep slow breaths, feeling it fill your stomach and into your diaphragm.

Then another technique called alternate nostril breathing. I'm trying to teach my kids how to do this when they get, like, hyper excited, to calm down. So you close one nostril, breathe, and then close the other nostril, breath. It's actually pretty calming. I feel more calm right now, but good. This is very calming.

Lindsay Weitzel, PhD:

Do you breathe out that same nostril or you breathe in one and you breathe out the other?

Lauren Natbony, MD:

You could do either. Then there's different like box breathing. There's different counts of breathing. I like to do the four, seven, eight breathing, which is basically you breathe in for four seconds, you hold it for seven seconds, and then you exhale for eight seconds.

Lindsay Weitzel, PhD:

This is the one that helps me. I'm a box breather.

Lauren Natbony, MD:

That helps me. It helps you. And there's actually apps for it. They're actually breathing apps that can actually count with you for breathing. But I feel like you can probably remember just the four, seven, eight. So, when I'm in that situation where I'm like, I'm being chased by a tiger, but I'm just really stressed out, I'm doing the four, seven, eight breathing can help bring up my parasympathetic.

Lindsay Weitzel, PhD:

Right or the pain. I'm sorry, it can be a constant tiger.

Lauren Natbony, MD:

Thank you. That's what I meant to say. It's like pain is the tiger. It's the metaphorical tiger. It is seeking you, activating you.

Lindsay Weitzel, PhD:

Yeah, right. And so for me, the technique that I finally found helpful. And it took forever for someone to teach it to me. And I was like gosh none of these breath techniques are helping me. And then someone taught me box breathing, and I was like, oh, that one actually helps me. So, if you haven't found one yet, that helps you, keep looking and keep trying the various kinds, because it took me a while to find the one that would really help me.

Lauren Natbony, MD:

I totally agree. And I think this is also the basis of sort of biofeedback and mindful like...this is incorporated into these other techniques which we know have evidence for migraine. And I think a lot of times it's hard to delve into these types of treatments, but just the breathing alone can be helpful. But again, it's finding the breathing that works for you.

Lindsay Weitzel, PhD:

Can lifestyle changes, are there other lifestyle changes that can help both autonomic dysfunction and migraine.

Lauren Natbony, MD:

So, I always talk about exercise, and I feel like I know it's an over said thing. But exercise improves autonomic tone. So, it improves our balance between sympathetic and parasympathetic. So regular exercise is important. My favorite topic sleep. So, consistency of the sleep schedule is really important. Again, regulating stress. And I feel like stress management is a really hard one because we are all stress and how do we manage stress. I'm still trying to figure that one out, but that's where some of that meditation mindfulness, relaxation can be helpful.

Those are the main ones. But it's basically finding, everyone is different too, like there are certain things that are going to make you more calm versus more put into sympathetic overdrive. And finding what those are for people. For example, I love playing music and playing music calms down.

Yeah, helps me sort of just release and probably breathe, and sort of increase that parasympathetic. So, there is a lot of different things. And I think when we're in that mindset of just in pain and want to escape it, it's hard to figure out exactly what the right thing is for you. But just knowing that there are things, we just have to try and find what works.

Lindsay Weitzel, PhD:

We're going to move on to a more specific diagnosis here. So, for anyone watching who has POTS, if you could please explain what that is. Can you describe the connection between POTS, the autonomic nervous system, and migraine. Because there is one. And I would feel like we didn't do justice to anyone watching who fell into those categories, if we didn't bring it up.

Lauren Natbony, MD:

Absolutely. So, POTS is one type of autonomic dysfunction. For diagnostic criteria, it is that there is an increase in heart rate of at least 30 beats per minute upon standing with no change in blood pressure. So, your blood pressure doesn't change, and your heart rate inappropriately increases.

Lindsay Weitzel, PhD:

Which is why they, tell them what it what it stands for. Postural....

Lauren Natbony, MD:

Postural orthostatic tachycardia syndrome. So when you're upright, orthostatic is the change from sitting to standing. Tachycardia is elevated heart rate. But it is a syndrome that's really important to point out. A syndrome means there are tons of different causes. Being bedridden and being chronically ill can lead to POTS because it's a blood flow dysregulation that's happening in some forms of POTS

So it's not always a sort of disease state that can't be cured. It is a lot of times secondary to something else. But the symptoms of that should be orthostatic intolerance, meaning it is much harder to be upright than it is to be supine. So being upright leads to less fatigue, brain fog. A lot of my patients will say exercise intolerance in the sense of they're so drained, so drained after exercise that it is really problematic. Again, we're not getting that oxygen back to our brain. Appropriate blood flowing appropriately.

So I feel like, yes, you don't have to have POTS to have autonomic dysfunction, but people who have POTS tend to have migraine. And is definitely, definitely associated because they both involve autonomic dysfunction. And they also both involve sensory hyper stimulation. We think that there is a link between the sensory and the central nervous system becoming overly sensitized.

That kind of links it together. I think we're still studying it, but there is definitely some evolutionary link. And we also will actually also look at migraine. What things make migraine worse, postural changes. So some people will get worse when they're bending, when they're laying versus standing versus when they're dehydrated. When they're tired, migraine will get worse.

So I feel like those are all shifting the balance of fluid in our body and our volume status, which is very similar to what happens with POTS.

Lindsay Weitzel, PhD:

So treating ANS in some of the ways that we've mentioned, can it help both things, the migraine and the POTS?

Lauren Natbony, MD:

Absolutely. So that's why I like vagal nerve stimulation because that helps. I use it first line for both migraine and POTS. Heart rate variability training. So things like HeartMath or doing biofeedback and basically training the autonomic nervous system I find incredibly beneficial. Yes, it takes time, but you are getting both of them.

Proper hydration. And I feel like everyone always gets to drink more water. But the reason I say to stay hydrated is you are regulating your autonomic nervous system. So that is super important.

But yeah, there's definitely an overlap. And I think it's always a good idea to check for it. And treating it can really help migraine. I've had a lot of patients where they're so refractory, but then we recognize that this autonomic piece is playing a role. And finding that and then appropriately treating it makes a huge difference.

Lindsay Weitzel, PhD:

Well, is there anything else you'd like to add to our topic today? I think the breathing was particularly helpful, particularly since we were talking about the ANS and giving some reasons and explanation. So I think this was an awesome episode, but is there anything you think we should add?

Lauren Natbony, MD:

I think we covered, there's so much I could talk about, but I think we have covered it all. But I just always want to tell people that, like, if you think that you do have an autonomic nervous system dysfunction, if someone just doesn't feel right, talk about it. It's not just in your head, like there is something going on and I find that so many patients come to me like I'm tired. And I was told, you know what, I just need to get more sleep or I'm having a lot of nausea and balancing my GI. Yes, that can happen. It can happen with migraine. And we should be acknowledging that and talking about it because awareness is really important.

Lindsay Weitzel, PhD:

Well thank you so much. Thank you for being with us today. Thank you everyone for listening in to this episode of HeadWise. Please join us again for our next episode. Bye-bye.

Lauren Natbony, MD:

Thank you.