



INTERVIEW TRANSCRIPT

DISCUSSIONS WITH WORLD-LEADING EXPERTS

Can Long COVID Cause Migraine or Make it Worse?

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Introduction (00:04): For some people, COVID-19 has come and gone, but for millions of others, its effects linger, sometimes for months or even years. This condition known as long COVID can cause a range of symptoms including fatigue, dizziness, brain fog — and for many, migraine. In fact, for a growing number of people around the world, COVID seems to have sparked migraine or made it worse. So what exactly is happening in the body? Can infections like COVID cause migraine?

Introduction (cont.) (00:35): And what can we learn from this connection to better manage symptoms and find relief? Today, we're joined by Dr. Patricia Pozo-Rosich, a neurologist, researcher, and director of the headache unit at Vall d'Hebron University Hospital in Barcelona. Dr. Pozo-Rosich is one of the world's leading migraine experts and has been investigating how infections like COVID-19 affect the brain and headache disorders. Dr. Pozo-Rosich, welcome back to the Migraine World Summit.

Dr. Pozo-Rosich (01:03): Thank you. Thank you for having me here. It's a pleasure to be back at the Migraine World Summit.

Carl Cincinnato (01:08): Let's start with a bigger picture before we zoom in on COVID. We know that migraine can sometimes worsen or even begin after an infection. How can infections, whether viral or bacterial, lead to migraine or make it worse?

Dr. Pozo-Rosich (01:20): It is an interesting question that probably has not been fully explored at a scientific level. But let's go one step back and think about what we know about what migraine is. And migraine really is — I would define it as a neurosensorial vascular inflammatory disorder, which means that inflammation is a part of what is going on in migraine.

Dr. Pozo-Rosich (01:46): And that means, really, that probably there is an increased facilitation, which means that I actually can trigger inflammation easily, or a type of inflammation — maybe not every type of inflammation. So for a migraine individual, it is easy to trigger inflammation when migraine attacks happen. And if you keep on having attacks very often, that inflammation stays a bit in your body, in your meninges, around the whole body.

Dr. Pozo-Rosich (02:21): So I always say that probably — and we don't know — but to trigger migraine, this is like a circuit, which means that there are certain triggers, which sometimes for easiness I call switches, that can activate or deactivate the circuit. And I do believe that inflammation is one of them.

Dr. Pozo-Rosich (02:44): So probably after having an important infection, that might then create a whole inflammatory reaction that might help have more migraine, or sometimes trigger a migraine disease that you didn't know you had before. Because unless you start having attacks, you don't know that you're a migraine-predisposed individual.

Dr. Pozo-Rosich (03:13): Then on top of it, COVID specifically, which is different from other infections, is very, very inflammatory. But it acts also at a vascular level, which means that we know currently that it especially affects the vessels, the small vessels that we have in our body. And that's where migraine pain happens, which is in the meninges. These are a network of blood vessels that are [found] on top of the cortex of our brain, and underneath the skull, the bone.

Dr. Pozo-Rosich (03:51): So probably all of these inflammatory processes, but specifically those that create this endothelial dysfunction in the vessels, probably don't help either, specifically because in migraine that is probably one of the key mechanisms that can [cause] pain.



Dr. Pozo-Rosich (04:12): Then there is another very important aspect, which would be another of the switches that can go on or start when you have a disease like COVID, and specifically after all of the fear that the pandemic created.

Dr. Pozo-Rosich (04:27): And that is that in order to become a person with chronic migraine after COVID, or having an infection by COVID, it probably has also to do with some internal resilience factors, which means really that if either the pandemic or because at that time point — probably just before, a month before, sometimes years before — you actually have an infectious inflammatory disease, or if you are undergoing some stress, or you're fatigued, and that usually can happen because of physical but also emotional reasons.

Dr. Pozo-Rosich (05:11): So there's what we call stress, which is a hypervigilant state that creates fatigue, energy loss, that probably also is very migraine-[inducing]. It's another important switch if your fatigue levels are not appropriately controlled, and that can also help too.

Dr. Pozo-Rosich (05:33): So if we believe that migraine is somewhat of an adaptive, protective reaction that the body might trigger in order to try and rest and protect itself, developing migraine after all of these things that I'm mentioning might be a resource that the body finds internally to actually protect itself and rest and recover.

Carl Cincinnato (06:03): Migraine in that context might be considered a coping mechanism to handle these additional stresses and strain on the body. And there was a lot in that response, so I just want to replay the three key themes that came out there. One of them was stress and fatigue and that playing a role. The other was blood vessels, and the other was inflammation. So all of those three can work mechanistically to trigger or to cause migraine in the setting of an infection like COVID.

Dr. Pozo-Rosich (06:37): Exactly.

Carl Cincinnato (06:39): Does it tell us anything about the immune system and the brain?

Dr. Pozo-Rosich (06:43): Yeah. Well, this is something that currently, for example, in our research group, we are trying to explore at a preclinical level. So not yet in human beings. But I do believe that [the answer to] your question is probably yes. Nowadays, what we call migraine is a syndrome. A syndrome in medicine means an adding on — so a number of symptoms. And symptoms are just one of the specific things that I feel are happening to me, in this case, when I have migraine.

Dr. Pozo-Rosich (07:16): So what are the symptoms that we all know about? Well, headache is one of them; nausea, for example, could be a second; cognitive disturbance, a third; vertigo, fourth; and aura, fifth. So all of these symptoms — when they come together in a certain way, we call that migraine. But probably this concept of thinking that everyone with migraine around the world is alike is probably not fully true.

Dr. Pozo-Rosich (07:48): And this is what, at a scientific level, we would call intermediate phenotypes, which means really that the genetic background, but also the epigenome — so what we are exposed to can probably trigger different types of migraine, even if the last effector of what is going on could be an increase in potassium levels.

Dr. Pozo-Rosich (08:15): But what brings us to that point, that ends up triggering all of these symptoms that we know nowadays about, might be different things at a genetic level, at an environmental level, at an intrinsic molecular level. And I think that is something that we will continue to understand and explore.

Dr. Pozo-Rosich (08:43): And one of them is what you were mentioning: some type of immunological reaction. It's something that has been lingering in the migraine field for years and



comes in and out depending on how much research and scientific information we have on that specific matter.

Carl Cincinnato (08:56): I mean, it would make intuitive sense to me because I find, personally, that whenever I have a flu, or a strong cold, that I'm far more vulnerable to a migraine attack. And I always just chalked it up to additional inflammation, stress and fatigue on the body. And it seems like there might be a similar connection here, too.

Dr. Pozo-Rosich (09:15): Oh yes, definitely. And I always say that on top of it, if it's a respiratory-linked virus or viral infection — because you can have gastroenteritis or some other viruses — clearly that is where inflammation mainly is happening in adult migraine. I always say that in children it's sometimes a bit different because they have more abdominal pain and who knows what is going on there.

Dr. Pozo-Rosich (09:44): We still don't fully understand why all of these symptoms change in different ages and age groups. But going back to adults: Having an inflammation in the same place where you're going to have a migraine attack, which is your head, probably doesn't help either on top of it.

Carl Cincinnato (10:06): Were there other types of infections before COVID that were shown to cause or worsen migraine or chronic headache?

Dr. Pozo-Rosich (10:14): Well, before COVID, when I spoke to patients and taught them — because, especially in every first visit that I have with patients, I try to teach them about what migraine is and how they can manage their migraine. And when I did that before COVID, I always said that allergies, for example, in the springtime here in Europe, and also infections, especially respiratory infections, might trigger migraine attacks.

Dr. Pozo-Rosich (10:48): And we all know that when we have fever, the type of pain that a migraine person has is more similar to migraine than just having fever. Some people even — it's hard to imagine that they have fever without having a lot of head pain, and maybe that's the only time when they actually have head pain.

Dr. Pozo-Rosich (11:10): So, yes, clearly fever and many different infections, especially respiratory ones, can trigger a migraine attack or migraine pain, or migraine-like pain in a predisposed individual.

Carl Cincinnato (11:26): Since the start of the pandemic, we're seeing many people report new or worse migraine symptoms after a COVID infection. What have you and others observed in the research community?

Dr. Pozo-Rosich (11:37): Well, I would say that we've seen everything: “Everything” means new migraine — people that had never had migraine who started having migraine after a COVID infection. We've seen people worsen their previous migraine, and that means, in our world, an increase in frequency, in the intensity of attacks, the severity, the refractoriness — so the whole thing gets worse.

Dr. Pozo-Rosich (12:12): We've seen all of that, but we've also seen other symptoms, like a chronic generalized pain syndrome, chronic generalized fatigue, and that goes together with many other inflammatory or noninflammatory processes around the body. I would say that probably everything and anything has been seen, also some cognitive dysfunction.

Carl Cincinnato (12:42): Julie from our community said that she started having chronic headache and migraine after COVID in 2020, and they still haven't improved. Is there any research showing whether post-COVID headache and migraine tend to get better over time?



Dr. Pozo-Rosich (12:54): No, I don't think there's any research, although as I was saying, many patients, at least in my experience, could end up improving.

Dr. Pozo-Rosich (13:03): I think that after so many years, you don't really know how much of that was really like COVID or long COVID, because we still don't know if long COVID fully exists and for how long. We have not defined that problem yet. But I would say that I would try, in her case, to probably do a multidisciplinary type of approach. She probably already has in all of these years, but actually thinking about other things that might be making all of this persist in time.

Dr. Pozo-Rosich (13:36): Currently, after five years, it's all of her symptomatology, but maybe trying to think what are the things that she can actually change or do to decrease energy loss and recover energy. So, think about how I sleep, how my life is about, if it had to do also with some type of life changes that I was going through. Think about things that are not only about COVID, because it's usually not only about COVID.

Carl Cincinnato (14:11): So, for Julie, she might benefit, if not already, from a robust migraine management plan where she has multiple strategies, multiple treatments and medications, potentially, to really robustly try to bring it under control.

Dr. Pozo-Rosich (14:26): That's right. That's how I would approach it.

Carl Cincinnato (14:29): Cedar, another community member, had the question: Can long COVID actually cause migraine to change types, for example, from episodic to chronic, or from classic to vestibular migraine?

Dr. Pozo-Rosich (14:40): Yes, yes. And we don't know if it's COVID again, or if it would have happened anyways, or maybe it accelerated that change, because migraine is a lifelong disorder. And during life, symptoms change, and maybe you had COVID during menopause or you had COVID when you did this transition from being a child to a young adult. So, there's many, many moments in life where migraine actually changes.

Dr. Pozo-Rosich (15:21): So I mean, who knows? As I said, migraine is a multifactorial disease with many complexities. And just one straight explanation for everyone is not the case — that wouldn't explain everything.

Carl Cincinnato (15:39): Rachel from our community had a question about whether chronic migraine increases the risk of developing long COVID or may make someone more likely to experience neurological symptoms like functional seizures or fatigue. Can you also explain what functional seizures are for our audience?

Dr. Pozo-Rosich (15:57): Sure. Seizures in neurology are epilepsy — epileptic seizures — that's what we call a seizure in neurology. Because seizing could happen also in other contexts. But for a neurologist, that's epilepsy. And epilepsy is defined, a bit like migraine, by the presence of attacks that we call seizures that happen every now and then. Usually a little less frequently than migraine, but not always.

Dr. Pozo-Rosich (16:29): So meaning that it is a very strong neurological, sudden dysfunction where all of the electricity that the brain has, either at a focal level — a part of your brain — or a generalized level — the whole of the brain — start going like ... in Spanish, we would have the word *cortocircuito*, which means really like if the circuit would kind of ...

Carl Cincinnato (17:02): Short circuit?



Dr. Pozo-Rosich (17:04): Yeah, exactly. And the electrical activity loses synchronicity because our brains work with waves of electric impulse. So, that's a seizure. Usually seizures happen mainly because of two reasons: One is a neurodevelopmental disorder, meaning that when all of the brain and then what we call axonal and neuronal migration happens when you are being formed and you're developing as an embryo. That can have problems, in the sense that it's complex to put everything in place.

Dr. Pozo-Rosich (17:58): So you might have an issue there on how you were built — it's architecture, at an architectural level — and that might facilitate that this part of the brain then seizes more frequently, or seizes in general. So that's one of the main reasons. And then we have other types of seizures, which we call secondary, and they are secondary to brain lesions, sometimes a stroke.

Dr. Pozo-Rosich (18:30): It has to be something quite big and it has to be something that touches the meninges usually, and also the cortex. That's where the risk of having seizures is greater. OK, so that's a seizure, and usually we have treatments for seizures. We have ways of diagnosing them with electroencephalography [EEGs] and MRIs, imaging and so on.

Dr. Pozo-Rosich (19:02): But then functional disorders are complex, too. Sometimes, if at an unconscious level — you are not aware of it — if you are put in a situation of fatigue, stress, and your brain has understood that seizing, having a seizure, is also somewhat probably protective — at least that's a very simple explanation of what functional disorders could be — your brain then starts a seizure, which is functional; meaning that it serves a function of protection, but it doesn't really correlate with real electric dysfunction.

Dr. Pozo-Rosich (19:38): So you actually have all of the symptoms, but if we would do an EEG or measure your electroencephalographic activity, you will not find the pattern that we are used to seeing in the EEG that corresponds to an electric seizure. OK, so that is what we call functional, and functional disorders usually happen in people who already have the disease, meaning that a person who has, let's call them, electric seizures, can also have some functional ones in between.

Dr. Pozo-Rosich (20:17): And the percentage of how many functional and how many electric ones you have varies amongst individuals. Some people have zero functional and others have a lot of functional, like maybe 90% of them. So just that balance is not the same for everyone.

Dr. Pozo-Rosich (20:37): So, as we were already saying, I also actually believe that some migraine attacks could be functional too, by the way. But that is something that in the migraine field we are still not able to demonstrate because we don't have this biomarker, which is the electric activity that we can measure from the brain.

Dr. Pozo-Rosich (20:56): But I am sure that happens, too, in some migraine attacks, especially in the chronic migraine individuals where there are so many attacks. It's almost unbelievable to think that all of that is linked to such a complex process that we know happens during attacks. But then going back to the question, yes, of course, anything can facilitate anything, and especially if that thing is stressful for the individual, such as long COVID, could facilitate the presence of functional seizures.

Carl Cincinnato (21:28): And chronic migraine could increase the risk of developing long COVID because the body's already got that stress and fatigue?

Dr. Pozo-Rosich (21:36): Sure. The body's already in this very stressed and fatigued [state]. I'm not sure if I could find even more complete words to convey what chronic migraine is.

Dr. Pozo-Rosich (21:53): But certainly, we know in general that chronic migraine — but any chronic disease, [like] lung or respiratory chronic diseases, psychiatric chronic diseases that are [strongly] expressed in an individual, heart chronic diseases, are linked to chronicity of every other part of the



body in the sense that once you become a person with chronic diseases, the probability, the risk of having another chronic disease besides the first one, or even two or three, is greater.

Dr. Pozo-Rosich (22:31): Probably part of it is because your biological equilibrium — your balance of what makes us stable — is starting to get lost or is somewhat unbalanced. Then I also believe that some of the medications and treatments that we give for one might actually facilitate a second one. So it's complex to understand all of these complexities that are linked. Human beings — we are very simple sometimes, and we try to think in a linear way.

Dr. Pozo-Rosich (23:06): So once upon a time, I had COVID, and then once upon ... but life, biologically, is not linear. That happens, too, with people trying to understand why they have attacks, and they think of what they had done half an hour before starting the attack. That probably has very little to do with why the attack happened. So we have to start not thinking in a linear way.

Carl Cincinnato (23:39): It's interesting to hear you say that, yes, it's true that chronic migraine potentially could make us more vulnerable to long COVID, but so could any other chronic illness that we're struggling with. And so the same is likely true for other conditions, diseases like that. We had a question from Shana. She said that some people in our community say that they experienced new or worsened migraine symptoms after a COVID vaccination, including vestibular symptoms. What does the research show about this, and are there short-term immune responses or could vaccines be playing a longer-term role?

Dr. Pozo-Rosich (24:15): Well, that's a question that has not ... I can tell you what I think about it, but I don't think that we have enough research. So, usually viral vaccines — we have many types of vaccines. You can vaccinate yourself against polio, against measles. We know that the protection ... So the basis of a vaccine is showing your body, kind of exposing it to a minimal expression of changes by a mutated type of virus — a fake one even, not the real thing. And then your body starts developing immunity against this vaccine. So the day that you will be exposed to the real thing, you will be prepared with a lot of immunity that will help you fight the disease.

Dr. Pozo-Rosich (25:15): So it won't be new; you will already be an experienced individual against that aggressor, and that aggressor can be a virus or other things that we can get vaccines against. Respiratory illnesses — the vaccines that we have are a challenge. For example, we get vaccinated for two of these diseases: the flu and maybe nowadays, COVID. So, how does the flu vaccine work?

Dr. Pozo-Rosich (25:50): Now the flu is starting here in Europe, or the Northern Hemisphere, and with the mutations — because these viruses mutate — they change all the time. So it's a challenge to find vaccines. For the main strain — the main virus that will affect the Northern Hemisphere — they will create the vaccine for you guys in the Southern Hemisphere.

Dr. Pozo-Rosich (26:16): Maybe you don't know, but Carl is in Australia; he's in summer while I'm here in winter. This is the magic of living on planet Earth. So, we create the vaccine that will help you guys next winter. That's a bit of how it works.

Dr. Pozo-Rosich (26:37): COVID vaccinations — initially, of course, we were little exposed, and it was a virus that was mutating very, very quickly. So they developed a different technique for that. When we are vaccinated by whatever technique, that creates changes in your body because you have a mild reaction that usually, at least in COVID, has been kind of measured; it can change some measurable parameters in the blood for around three or four months.

Dr. Pozo-Rosich (27:18): This is why — let's say, Carl — if you would come here to Europe now and stay for a while, you would have to get vaccinated for the flu right now here, and then go back — and not only because the virus mutates — go back to Australia for the winter and get vaccinated maybe even again. So, you could get vaccinated twice a year. And that's also why in COVID,



remember, when we were deep in the pandemic, we could get vaccinated every now and then for every new strain that came out.

Dr. Pozo-Rosich (27:44): And that's mainly because not only is there a new strain, but because the immunity that is left fades away quickly with these viral type of infections. So, I do believe that for some months you're affected by the vaccine, and that in a very sensitive individual might be enough to trigger a reaction. But the changes don't stay there forever. But there's still not enough research because we are lacking some biomarkers that would help us measure that.

Carl Cincinnato (28:19): Overall, how should people with migraine think about vaccination? Is it still safe and beneficial?

Dr. Pozo-Rosich (28:25): Yes. Well, you are asking me — probably depending on the person you ask, there are some very personal beliefs. You know, the problem with us human beings is that we have a bit of experience, a bit of science, a bit of everything. I can tell you that all of the background that surrounds me as a person is very, very in favor of vaccines.

Dr. Pozo-Rosich (29:01): Sometimes I think it's ... not the worst, but for planet earth, I am not sure if it's very good that human beings have vaccines, because before, people died very quickly already in childhood years; families had to have many children in order for two to survive, from 10 maybe. And all of this has changed, thanks to vaccines. So I would never dream of not vaccinating my child or vaccinating even myself. I vaccinate myself every year for the flu. I've used, of course, COVID vaccinations. So any type of vaccine, I think is very beneficial for the individual, at least as I'm saying, maybe not for planet Earth because we are too many nowadays and thanks to medicine, many people are surviving more than before, and that is kind of overpopulating the Earth in some ways. So, yes, I would say vaccines are very important, and [they have enabled] us to survive more as a species.

Carl Cincinnato (30:01): Judy heard a long-COVID clinic report that many of their patients also have Ehlers-Danlos syndrome, or hypermobility. Could there be shared mechanisms here, perhaps involving the connective tissue, inflammation, or autonomic dysfunction?

Dr. Pozo-Rosich (30:17): First of all, Ehlers-Danlos, just in case anyone who is listening has Ehlers-Danlos, is a complex disease. Why do I say complex? Because there are different types of Ehlers-Danlos. But the main, typical type is this hypermobility connective tissue disease where all of your joints are hypermobile and they actually luxate.

Carl Cincinnato (30:52): Double-jointed.

Dr. Pozo-Rosich (30:54): Exactly. So that's what happens. And that creates a lot of global pain in the sense that we have many types of joints around the body and all of these might hurt. So it's very painful. It's a genetic type of disease.

Dr. Pozo-Rosich (31:17): I've seen migraine individuals that also have Ehlers-Danlos, but I have to admit that from all of the experience of the many, many years that I've been treating patients with migraine, not that many have Ehlers-Danlos — sometimes you could say even to my surprise — which means really that probably there is somewhat of a chance of you having both, as migraine is very prevalent, but they don't always have to happen together.

Dr. Pozo-Rosich (31:53): However, yes, I do believe that the vascular system — the arteries that move blood around the body — in migraine individuals are a bit different, and that could perhaps have some type of link to Ehlers-Danlos in some way. So they might have some common mechanisms, but I don't think it is an immediate reaction, or diseases that need to go together all the time.



Dr. Pozo-Rosich (32:25): In relation to autonomic dysfunction — and you mentioned POTS [postural autonomic tachycardia syndrome], I think — yes, again migraine attacks trigger or are linked to autonomic transient dysfunction, meaning that during an attack, both your sympathetic and parasympathetic nervous system gets activated. And that's what we call the autonomic nervous system, which is autonomic because the word comes from being autonomous.

Dr. Pozo-Rosich (32:56): You as an individual cannot control it or modulate it; meaning that you cannot say, "I want my heartbeat to go faster or slower," or I cannot decide if I want to sweat or not, or if my pupillary reactions dilate or constrict. So there are many autonomic functions. And when we have an autonomic dysfunction, usually it's not about every part of the autonomous nervous system either.

Dr. Pozo-Rosich (33:33): Having said that, I do believe that again, these two conditions — migraine and POTS — could go together. Again, all of this [may or may not] be linked to the risk of having long COVID. It doesn't happen in every person that has all of these things that we are mentioning.

Carl Cincinnato (33:52): Can you tell us what POTS is and whether POTS or another autonomic symptom like dizziness — why they might sometimes appear together with migraine and long COVID?

Dr. Pozo-Rosich (34:06): Well, dizziness is a very generic or generalized symptom. It can happen with many different things in our lives. Why? Because dizziness in my mind is an expression of fatigue, as we were saying before, very much linked. Because I always say when you have fatigue — let's say that right now, you're going towards your evening; I'm starting the day, you woke me up early — so I could be fatigued, let's say.

Dr. Pozo-Rosich (34:39): So what will we do? Suddenly I'm speaking to you here on the screen and I'm fatigued, I will start closing my eyes without even wanting it. If I'm fatigued, I will open my jaw a bit, I lose muscle tone, and my head will kind of go to one side because I'm trying to go to sleep. So if I'm trying to resist against fatigue, what we actually do is try to open our eyes.

Dr. Pozo-Rosich (35:08): And that's why sometimes when you're fatigued, people will say, "Your eyes are red." That's because you are [resisting] blinking to avoid closing your eyes, and you're putting strain in your general muscle tone to keep yourself awake. And that means also cervical posture and muscles. So dizziness comes from not feeling in your place. And that comes from putting a lot of strain in muscle tone to keep you in one position.

Dr. Pozo-Rosich (35:45): But then when you try to move from that position to another one, the feeling that your brain has — usually because you're also fatigued at the baseline — is like dizziness because by trying to stay awake in one position, all of your muscle tone is very rigid. So as you start losing flexibility, you start losing this dynamism that actually helps you control your equilibrium. Which is very different from vertigo.

Carl Cincinnato (36:21): Interesting. So for people whose migraine began or worsened after COVID, what can be done right now to manage symptoms? Are the standard migraine treatments still effective?

Dr. Pozo-Rosich (36:33): Yes and no. Some people who will listen to us will say, "Well, that didn't work for me. I tried" But in general, I would say that I've seen many cases where what really happens is that you are already an individual with migraine; if you ask a bit, this person has already had somewhat of migraine attacks in their life, but they were easily controlled.

Dr. Pozo-Rosich (37:01): So the difference — what makes someone say, "I have migraine" — is very much linked to refractoriness or not finding the right treatment. If you have milder attacks, and you



take an ibuprofen or any type of anti-inflammatory, and that works, then you don't believe that's migraine because, "If I'm taking something which is very easy to take, this is nothing. If this helps me, this cannot be something bigger."

Dr. Pozo-Rosich (37:27): So usually it's people that have had milder migraine in their life and then suddenly the migraine attacks increase in severity and refractoriness. And that is part of the problem then. Then usually if you seek help and a physician teaches you how you can treat your migraine attacks, usually that is very helpful for many. It has to be, kind of, "real migraine," in the sense that the symptoms have to be very much like migraine.

Dr. Pozo-Rosich (38:03): Chronic daily headache, which is something different, sometimes does not respond to migraine therapy when you actually develop it because of long COVID or any other thing.

Carl Cincinnato (38:16): We've spoken quite a bit about energy levels, and I'd like to ask you how important is pacing, rest, and gradual rehabilitation for people who are dealing with fatigue and brain fog along with migraine? And when we talk about energy, are you talking about brain energy or our body energy? How would you define it?

Dr. Pozo-Rosich (38:39): I think in general, taking care of yourself and doing that with movement — rehabilitation — with an understanding of where your thresholds of energetic loss are. So don't push it to overdoing things and going to your limits all the time. Living in a sub-threshold level, I think, is very useful. And sometimes they have to teach you how to do it.

Dr. Pozo-Rosich (39:16): And that's what rehabilitation could do for you. Coaching, psychologists — there are many ways of approaching the problem of learning about yourself and teaching yourself how you are and what your brain is about and your body's about. And then in relation to the second part of that question, energy is in every cell of your body. Our cells have batteries. Within a cell there are many types of things in there — it's very complex and interesting — and one of them is called the mitochondria. And that is the energy factory of every cell.

Dr. Pozo-Rosich (40:09): So when I'm talking about energy loss, it's global, probably. As I'm a neurologist, I would say brain energy — the energy that we have in our brain cells — but I believe it's probably quite global. We don't know, but I think cells are quite synchronic, and if you start to get tired it's because all of your cells are starting to get tired.

Dr. Pozo-Rosich (40:35): I always say that every morning you wake up with a certain amount of petrol or gasoline — energy that you have — and you have to take care of really making sure that all of the recovery of that energy is properly done. And that's very basic but it's all about sleeping, eating, movement — basic things that actually refuel your energetic balance.

Carl Cincinnato (41:05): Are there studies underway looking specifically at treatments for post-COVID or long-COVID migraine?

Dr. Pozo-Rosich (41:13): No, I'm sorry to say that we don't have ongoing studies on that specifically. I know that long COVID is being studied at a biological level still, meaning that we still need more science to understand how perhaps that could be addressed.

Carl Cincinnato (41:30): What gives you hope about the ongoing research in this area, both for understanding long COVID and for improving migraine care in general?

Dr. Pozo-Rosich (41:39): Well, I always say that in migraine research, we need more funds or more money in general. It is a very underserved research area. This doesn't mean, though, that the groups in the world currently doing research — we are kind of able, but it's not easy and they are very small amounts — that we are not able to find the resources to do research, but it is very far away from many



other neurological diseases and I'll put as examples: multiple sclerosis, Alzheimer's, even epilepsy, Parkinson's ...

Dr. Pozo-Rosich (42:23): Migraine is kind of the disease where less money is given. I always say that has to do with stigma — but not only stigma of the disease — stigma related to what society feels is important, meaning mortality or physically disabling diseases. So, being in a wheelchair; dying from it; losing neurons in our case, losing cells because of the disease, degeneration gives a disease importance. And that's where the money goes.

Dr. Pozo-Rosich (43:04): So migraine — we still have to do a lot of research to understand how much of it could be considered a progressive disease, how much we are actually saving the world from, and making it valuable for funding bodies, private or public, to give money for research. So much more research should be done. However, I have to admit that from the “smaller” research that is being done, we have already found several important treatments. And in some other diseases, that has not yet happened.

Dr. Pozo-Rosich (43:45): So at the end, we kind of make the best of what we have. And luckily in the 1980s and 90s, so — 30, 40 years ago — a basis of what migraine could be — I think it's more complex than what was thought 40 years ago — but the basis at least of migraine pain was quite well studied and addressed. And at least we have that covered for many people nowadays.

Dr. Pozo-Rosich (44:12): We are still looking into some other peptides, molecules that could be controlled with therapy, and there are currently trials being done around the world for other new compounds. We still don't know if they will get to the market. They are still in very early stages of research.

Dr. Pozo-Rosich (44:36): But hopefully, I am quite convinced that we will have different approaches to the problem in the future for sure. And I also hope that we will develop some diagnostic tools and some better ways of quantifying migraine at a biological level. Because I think that's the next step that we need.

Dr. Pozo-Rosich (44:56): There are two main things, in my mind, that we need. One is longitudinal studies, meaning following individuals during life. It's very challenging because people usually — you lose them — they get less invested, their life changes. There are many things going on. Unlike other diseases where they have been able to follow people for many years, in migraine it's not as easy.

Dr. Pozo-Rosich (45:24): And then the second big thing I think is that we need ways of measuring and quantifying migraine at a biological level — what we call biomarkers — because it will be the only way of dignifying the disease in some very tangible way, in a way that you can actually touch. It will also probably give us further insights on what is going on during migraine attacks in a migraine body, in a migraine brain. So all of these things are interesting.

Carl Cincinnato (46:00): So there's a lot that we could be doing and there's a lot of research opportunities if we have the funding to do so, which is encouraging. For those people watching who might feel discouraged — maybe their migraine started after COVID and has been worse ever since — what is your message of reassurance or hope?

Dr. Pozo-Rosich (46:21): The first thing I would say is to keep on trying, in the sense of finding — I'm sure maybe they've already gone to many physicians, but sometimes just finding the right physician for you can help and makes a difference. The second thing is that, I do think, in my experience — and I've seen a lot. My thing is to see people that have been seen by previous doctors — so second, third, seventh opinions and there is usually, or many times, something else to do. It doesn't always happen but sometimes there is something else to do. And if not, sometimes, I mean, I understand — I won't say that everyone that I have seen improves, but many people end up coming to



terms, perhaps. And when you fight less with whatever problem you have, suddenly certain doors start opening which you didn't even think were there. Sometimes that happens, too.

Carl Cincinnato (47:32): Dr. Pozo-Rosich, it's been a fascinating interview. I've learned a lot about COVID, long COVID, and migraine. Thank you so much for joining us again on the Migraine World Summit.

Dr. Pozo-Rosich (47:42): Well, thank you, Carl, for inviting me. It's always a pleasure to participate in the Migraine World Summit. Thank you.