ORS Public Outreach Committee - Ask The Experts (Current Trends in the Treatment of Tendinopathies)

[00:00:00] Moderator Introductions

[00:00:00] Jason Marvin: My name is Jason Marvin.

[00:00:01] I'm currently a postdoctoral fellow at Mass General Hospital, and I'm the incoming chair of [00:00:05] the ORS Public Outreach Committee. Today I'm joined by my co-moderator, Dr. Stephanie Cone, [00:00:10] and we're really excited to have this great lineup of speakers today on the topic of “Current [00:00:15] Trends in the Treatment of Tendinopathies” as a second installment in the ORS Ask the Experts [00:00:20] interview series.

[00:00:21] For those unfamiliar with this initiative, the [00:00:25] goal of this expert interview series is to leverage basic science and clinical perspectives and expertise to address [00:00:30] challenging and or timely topics in orthopaedics research. Ultimately, our goal is to provide [00:00:35] information to the general public in an accessible manner.

[00:00:37] And this being the second installment in the series, we're [00:00:40] very eager to extend this to tendon. That is my own background from [00:00:45] my doctoral and postdoctoral research. And I'm going to pass it off to Stephanie to introduce [00:00:50] herself before we introduce our speakers today.

[00:00:52] Stephanie Cone: Sure. Hi, everyone. I'm Stephanie Cone.

[00:00:54] I'm an Assistant [00:00:55] Professor in Biomedical Engineering at the University of Delaware, and my involvement [00:01:00] in ORS is primarily with the tendon group as well. I do a lot of tendon [00:01:05] biomechanics, both in ex vivo and in vivo or human studies [00:01:10] states.

[00:01:10] Speaker Introductions

[00:01:10] Jason Marvin: And I will introduce one of our speakers for this session, Dr. [00:01:15] Neal Millar, who is a Professor of Orthopaedic Surgery and academic consultant orthopaedic surgeon [00:01:20] based at the University of Glasgow, specializing in shoulder surgery and tendon injuries, having completed [00:01:25] fellowships in Sydney and New York.

[00:01:26] His laboratory's research focuses on the immunopathogenesis and translational [00:01:30] immunobiology of soft tissue musculoskeletal disease, including tendinopathy. [00:01:35] He has been instrumental in leading and designing clinical trials of novel therapies in human tendon disease. [00:01:40] He has completed a worldwide phase II clinical trial of IL-17A blockade in shoulder [00:01:45] tendinopathy patients following his laboratory's discovery of a key role of IL-17 in tendon disease.[00:01:50]
And furthermore, his discovery of a single microRNA-dependent regulatory pathway in early tissue healing highlights a microRNA replacement therapy as a promising therapeutic option for human tendon disease, currently in phase I human development representing true translational science.

Additionally, he runs a specialist one-stop complex tendon clinic in the NHS focusing on improving the treatment of tendinopathy.

Stephanie Cone: And we also have Dr. Karin Silbernagel with us, who is a Professor and Associate Chair at the Department of Physical Therapy at the University of Delaware. She's a clinical scientist with a strong record of mentoring clinical scientists as well. Her expertise is in orthopaedics and musculoskeletal injury, with a focus on tendon and ligament injuries.

She's been a physical therapist for over 30 years and performed research for over 20. At the University of Delaware, she's the principal investigator of the Delaware Tendon Research Group and the Delaware ACL Research Group. Her work has been directly integrated into the clinical guidelines for treatment of patients with tendon injuries.

And she's presented her research at numerous conferences and published over 130 articles to date in peer-reviewed journals. She's also been invited to speak about her research at conferences, both nationally and internationally.

She's working to advance our understanding of tendon injuries and repair so that tailored treatments can be developed. Her research approach is to evaluate tendon health and recovery by quantifying tendon composition, structure, and mechanical properties, as well as patients impairments and symptoms.

Her research is supported by the NIH, the Foundation for Physical Therapy, the Swedish Research Council for Sports Science, and the Swedish Research Council.

**Question 1: What are tendons and why are they important to our physical health?**

Jason Marvin: Wonderful. So I guess just to kick off our Q&A, as we are really hoping to reach a broader audience, we're just going to start from the basics and ask what are tendons and why are they important for our physical health. And perhaps we can have Dr. Millar start us off.

Neal Millar: Oh, no, that's far too difficult for me.
That's a Karin question. I'll let Karin take that one.

Karin Silbernagel: Okay, so for me as a physical therapist, tendons are absolutely crucial for individuals for any kind of mobility and moving us forward. To me, from my perspective, working with a lot of lower extremities is that tendon actually keeps us, um, saves us energy, right? So if we're running and moving and things, the tendons can kind of store energy and then release energy.

So, for example, if you're a runner. Then if your tendons or Achilles tendon is really healthy, it takes you a lot less energy for you to run the same distance as it would, if you had injured tendons. Just like a car have good mileage per gallon. It's kind of that tendon keeps us healthy. And that also helps us, especially athletes, to perform at the highest level.

If you have a really good tendon, it can help you do that extra jumping, slightly higher. Give you a little more explosive performance. And in the hand, I guess the upper extremity is not my expertise, but Dr. Millar might be able to handle that more. But long tendons too, help us to kind of control movement and really manipulate objects.

So in the hand, we have really long tendons as benefits that.

Neal Millar: Yeah. That's, that's a really great, um, way of describing it. Kind of like that miles per gallon. I might use that, but yeah, upper limb. So I do a lot of upper limb work and you know, your tendons in your shoulder in particular will help you reach up to a cupboard more efficiently. Will help you have, uh, you know, lift weights, etc.

They are there to help you function and move your arm in space to, you know, function as a human being. And when things start to go wrong, they'll come on to that. That's really when it starts to affect your activities of the things that you need to be able to do. And that's why when tendons become damaged, they encompass a lot of normal activities. Not necessarily sporting activities, but just things you do around your home.

So that's why tendon health and keeping good tendon health is so vital as in young, middle, and as we age as well.

Question 2: What happens once our tendons are injured or diseased? What are the signs that tendinopathy has developed?
Stephanie Cone: Great. So kind of building off of that, I know we've started touching on what is important about keeping tendons healthy. But we want to ask a little bit more about what actually happens when our tendons are injured or diseased, and what some signs might be that tendinopathy has developed.

Karin Silbernagel: That's you, Neal.

Neal Millar: Okay. So, as a patient, if you have a tendon problem, you're going to present with a bit of pain. But you're mostly going to come into the room and say that you've not been able to do or not being able to function and do the things you want to do. Whether you're an athlete, as Karin said, your tendon Achilles pain and you can't store energy, you can't push off, you can't run versus an elderly lady or elderly individual who can't reach up to lift a cup of coffee out of their kitchen.

So that's when it starts to go wrong. And that's when it functionally affects a patient. And most patients that come into my rooms complain, yeah, they've got a bit of pain and discomfort, but they cannot do the vital things they want to do in their daily life. And that's when the disease sort of really impacts.

And we've learned a lot, I think over the last 15 to 20 years on reasons behind that. Tendon disease was mostly thought of as a mechanical problem and still, importantly, mostly is. But there's a strong process of aging as we get older. Unfortunately, everything sort of wears out and tendons are the same for that, but there's other mechanisms on other things we are discovering, such as inflammation. Such as hypoxia, where there's a lack of oxygen and also where the blood vessels that are supplying the tendon might actually introduce pain mediators or pain molecules.

And an area that Karin's been working a lot on and I really like is understanding actually. The sort of subsets of how different patients react to different problems with their tendons. I think that's a very important area for you, the patient, to sort of understand how it affects your life. How you can become depressed. You can have other health problems linked to having poor tendon health.

And it's that link between science, a bit of psychology. All of these things are vitally important in understanding how our tendon health gets worse and how then we could then treat it.

Yeah to add to that too from a physical therapist perspective. The people that come in to us is generally exactly like Neal was saying. It's usually have pain being active. Maybe not pain at rest, but I can't continue what I want to do. If that is walking. If that is playing sports or just kind of reaching for something as well.

And as a physical therapist, what we're looking for the signs of the tendinopathies. We use questionnaires to see maybe how pain and symptoms, but we also do evaluations of your function to see do you still have the strength? Are you
able? What are the deficits that you have? And for example, for walking or for jumping or for movement?

And then we also try to look at other questionnaires to see how it affects other parts of your life. And then we also try to look at what is it that you're needing to do to kind of figuring out why are you having more problems and what are other personal factors and things that looking at that can kind of explain why this happened.

Because it's not only where you're at now. It's like, why did we get here? And how can we get you back to fully recovered and address those issues, which we kind of know now can be a lot of various issues to understand if it's an athlete. Maybe just overused, but it can also be other metabolic syndrome, or other things that can kind of affect you and that's the physical therapies.

We want to make sure that we really try to address all areas to make sure that everybody gets the full potential for treatment.

**Question 3: What are common clinical treatment options administered to treat tendinopathies, and is there an optimal time for treatment?**

From a physical therapy perspective, I think exercise and loading the tendon and exercise rehabilitation for somebody that addressed and evaluated all your deficits. It's kind of the key. I think we all agree on that that should be the number one pathway to go for somebody to looking for treatments. Again, though there, it matters where you go. It should be somebody that actually have knowledge and understanding on how to train. It doesn't mean just to train or give somebody an exercise program, a piece of paper.

It's how you do it and how you address it for that individual person. So I think that's really, really important. But exercise and mechanical loading and loading the tendon are really, really important. Then there are some people that don't respond as quickly as others. So there are other ways to thinking about the injuries and things too, but that's kind of the highest level of evidence. If they're not getting better within, to me, between 8 to 12 weeks, and I don't see the improvement then I might continue to send them to somebody else's and send them to Dr. Millar. But anyway, so to send them to somebody else too.
However, it's also important to realize tendon takes a long time with the rehabilitation. We want to see a trajectory of improvement, but it could take 6 to 12 months to have full recovery. There's no way to kind of speed that up.

Neal Millar: Yeah. I wholeheartedly agree with Karin. I always do anyway, but I think the other thing to say as a patient is that it's understood, it's acknowledging the patient's problems when they come in. It's listening to the patient. It's not just suddenly saying you've got a tendon injury, you're going to do some physical therapy. Because there are a lot of background issues in tendon. Fear mechanisms if they've had poor treatment already or haven't really identified the problem. So there's lots, education is very important as Karin says, educating the patient that this is a two-way relationship, and it's going to take quite some time.

This is not something you can take a tablet for. This is not something you can just get an injection and you will suddenly be better. You have to put the effort in, and it's a joint sort of treatment plan. You start a loading program and you go with them. And as Karin says, it may not work and you may need to tweak it or you may need to add other things in down the line, but connecting with the patient and making them understand that at the start is vital.

And I think something that maybe we probably need to do better overall to help patients improve in this condition.

Question 4: Is reducing pain the only goal of treatment? Do patients need to take on additional treatment to restore their tendon structure and function?

Stephanie Cone: Great. So, if we think about this a little bit more, I know we've been talking about pain and maybe modifications to activities might be the reasons people walk in the door, right? If they're experiencing issues with tendinopathies, but are reducing pain and kind of restoring some of those activities, the only goals of treatment or do patients and the clinicians they're working with really take on additional treatments to restore tendon structure and function at kind of a tissue level as well.

Karin Silbernagel: Can I answer? Yes, I got this. I mean, I think these are very exciting questions and I think these are the things that as a researcher, we ponder a lot too. But I think the important part from my perspective too is that pain is the sign, but it's much broader things that are affecting you. It's affecting your whole health, the quality of life, it affecting function. And I think in order to improve, there is easy for doing kind of the yo-yo effect. You kind of load a lot, or you try to do too much. Or you walk too much one day, and now you have more pain. And then you're doing nothing. And then you have less pain and then you try to do things again, and that's not really helping. We need to improve the tolerance of the tissue.
while we're also focusing on making sure that you, the patient, understands how to address this in the quality of life or in life to be able to move and moving forward.

So, it's very important to thinking about that and we use a pain-monitoring model where we talk about having a pain up to a 5 when you load a tendon is okay. But if you go higher, it's something that you shouldn't be doing to kind of find what's available to do. Because I usually say if you only want to treat the pain, then people just stop moving and then pain free. But we want people to be able to do what they want to do with minimal pain.

So it's finding that balance of trying to keep people active without aggravating it while we're trying to heal it so that you can still be active. Because we really don't want people in general, because there's so many other parts relating to health that it's affected if you're not exercising or being active, both psychosocial or physical. So, it's really finding that balance of progressing to improve the injury while getting people more active while the pain maybe is fairly stable and then start as soon as you have more tolerance. Usually, that's when the pain starts to decline. But maybe sometimes we want to decrease the pain, and I send them to you.

Neal Millar: Yeah, I think it's an important aspect pain to a degree, but I tend to agree with Karin with my patients. It's a bit of a journey. We obviously want to improve your pain, but, actually, we want to make you physically, mentally stronger and better so that you understand how you're going to get out of that place that you're not really happy to be in at the moment. And as Karin says, pain drives many mechanisms within your brain, within your cardiovascular system, within your gastrointestinal system.

So, all over if you have a chronic issue with tendon pain, there are other strategies. Not just necessarily controlling the pain that are vitally important in patients, particularly chronic patients.

Question 5: How do we effectively convey to patients that full rehabilitation can be a long process?

Stephanie Cone: I know this is a pretty complex issue between different patients, but can we make any general recommendations or talk to any general scales of time that this type of tendon recovery might actually take?

Neal Millar: I'm a bit like Karin. I would see my patients every 8 to 12 weeks and connect with them and see how they were going. I tend to tell my patients that the way I put it in Glasgow is that you will probably stop moaning or complaining to me by about around the 6 to 9 month mark before doing it right.
If you're still moaning at me at 9 months, you feel free to hit me. But it may be a little bit longer. Those are sort of indicative timeframes. As long as you're truthful with your patient at the start, that's ultimately probably how long it's going to take. They tend to get on board, they do.

It's a little bit different treating elite athletes in that respect that it's their living and they want to get back sooner. That's a different conversation, but those are my sort of rough timeframes. I don't know whether Karin would agree with that.

Karin Silbernagel: Yeah. I usually say for full recovery, you can take six months to a year. My other guidelines a lot is that you're not fully recovered unless you've been pain free for a whole year. And that I talk as education early on. Meaning, this is something that you continue to work on, even if maybe the pain is gone. Just like we're doing everything else. When people have knee osteoarthritis, maybe part of these are things that we need to live in.

So, we have to continue to make sure. Just like you brush your teeth, maybe you need to continue with the exercises for the specific tendon. It's not, or medication. You don't stop the medication for blood pressure just because your blood pressure went down. It might need to be treated and continued. I'm also surprised sometimes with when we see our patients, I think with a really thorough education and finding that understanding between whoever treats you and the doctor, or the physical therapist, to whoever and the patient and understanding, we do see considerable happiness within 8 weeks to an exercise program. That does not always mean that the pain have changed drastically or the function of change drastically.

I think that really relates to understanding: what is my problem? What do I need to do for it? How do I plug along? I think often that sometimes is not glossed over when you don't have time. So really that initial, I think what Dr. Millar is talking about too is really meeting and having these discussions.

Then it's much easier to understand that this might take 6 months to a year. The other thing I think to say up front too is that you are going to have setbacks. All of a sudden, we'd go really well and then you hit a plateau and then you do something and it's getting worse. That is a normal progression too, and understanding that from the beginning I think have helped.

When I got better explaining that to my patient I think that's when they come back to me and say 'yeah I got some more pain, but you told me what's going to happen.' So they're less worried, right? It's understanding what the progress is. I think that's really important.
**[00:17:48] Question 6: How and when do you choose to recommend biologics over other treatment options, especially when the mechanism of action or clinical benefit are not always clear?**

[00:17:48] **Jason Marvin:** Wonderful. So we've talked a lot about this really pivotal role of exercise and just recognizing that the recovery is very long and complicated. You also talked briefly about how for certain patients, the recovery of their tendon function is quite essential, whether it's their jaw function or just the things they want to do and love.

[00:18:05] My question for the both of you now is: what do you do when a patient comes to you and perhaps physical therapy isn't growing as much as they wanted it to be? Whether they ask for other treatment options, such as surgery or biologics, in what cases do you recommend those options? And what do you do when evidence-wise, some of these other treatment options may not have clear mechanisms of action or the clinical benefit may not be fully established as of yet.

[00:18:30] **Neal Millar:** That's a good question. Complicated question. I can give you some ballparks of what I do to give you a guide. If they come and the physical therapy is not working, I always blame the physical therapist. So that's.

[00:18:44] I tend to revisit with the physical therapist what they have done, how well the patient is connected, etc. Then I would consider probably around the 3, maybe 3 to 6 month mark of adding in what we call adjuncts to treatment. So, adjuncts are adding in some other form of treatment along with physical therapy. I would just say that none of this is dropping the physical therapy. You drop the physical therapy, there's not really much point. These go alongside it.

[00:19:11] Examples of that are injections, which really we have moved away from but some clinicians still use those of steroid injections. There is also things like PRP, where you rightly say the evidence is not so clear. That's platelet-rich plasma, where a vial of your blood is spun down and re-injected into your tendon. Then there's more evidence-based treatments that I tend to use. Glycerotrintritate patches, it's a patch developed for angina or heart disease that in some patients can act to reduce inflammation and improve collagen production. And that works in a subset of patients.

[00:19:47] Shockwave therapy, for example, where an ultrasound pulse is delivered to a tendon. These are the sort of things we can add in at later stages should the physical therapy regime be not failing, but not seeming to work. But it's important for patients to understand also that as you do that, you're modifying your loading, your exercise regime with Karin, and you're being educated.

[00:20:10] And we're also appreciating all I think where we don't do so well. Maybe not Karin and I, but other clinicians don't tend to sit down listening to the patient's
psychosocial [00:20:20] issues. Is something going on at home? Is there something at work? Is there other things that may be [00:20:25] driving them not to be able to do their physical therapy or not engage in the program?

[00:20:29] Because [00:20:30] that's a crucial part of it as well.

[00:20:33] Karin Silbernagel: I would say too, there are additional things that [00:20:35] I do sometimes just in the clinic. If somebody has really a lot of pain and exercise is really hard, there [00:20:40] are other things that we can do as, you know, electrical stimulation.

[00:20:44] We [00:20:45] call it noxious stimuli and other things that we can help to kind of limit the pain at the time [00:20:50] when we're doing exercises. So, there is one thing there. Sometimes I just see that we hit a [00:20:55] plateau. We get people that get stuck. Those are the people when we want to start thinking about are there other [00:21:00] options, right? We're talking to the doctors, maybe are there other things that we can think that will work for this [00:21:05] person or moving things forward. I think also sometimes changing things up with [00:21:10] a loading and things. Tendons, I think sometimes get complacent with the same kind of [00:21:15] activity. Maybe we want to shake things up, or are there things like shockwave is what I can [00:21:20] use more clinic based.

[00:21:21] And there are people that sometimes need surgeries and other things as well. [00:21:25] So you need to be open for that too. I think it's really important to understand if people are [00:21:30] doing the exercises, not the exercises, anything that we can change. And I've had instances [00:21:35] too when I was supposed to treat somebody, and I was working with a doctor and they send them to me. And they [00:21:40] didn't come for their treatments and things and went back to the doctor 3 months later and said, oh, physical [00:21:45] therapy didn't work. So, now you need to do surgery. But obviously me and the doctor had already [00:21:50] talked. You know, didn't show up. And she's like, I know you didn't show up for the exercises, so I'm not doing [00:21:55] surgery unless you're doing the exercises.

[00:21:56] So, I think having that combination of understanding how things [00:22:00] move forward and really that it is important. Even if you do have surgery, [00:22:05] injection, and those things, I think the exercise is going to be really, really important to moving [00:22:10] forward. Sometimes I wonder just having those things, is that what really makes people[00:22:15] compliant? Or really starting with the exercises at the lower level?

[00:22:18] Sometimes we just want to start [00:22:20] with activity. We start with exercises and then we want to rush it, right? That's the main problem I see [00:22:25] people have been to other physical therapists or other places, is that they start really [00:22:30] well for 3 or 4 weeks. And then they're like, okay, now you're going to start running. Or now you're going to [00:22:35] walk, go hiking or whatever it is, or reaching too much, not really listen to the [00:22:40] biology and taking that time.

[00:22:42] But there's definitely places where other things needs to be [00:22:45] considered.
Question 7: How do patient demographics influence compliance and the incidence of tendinopathies?

Jason Marvin: This brings up a really great point because you mentioned obviously with some patients, there's a plateau in the benefit. But also coming up now is compliance with a lot of these regimes. Aside from patient compliance, we were curious if there are any other factors that you've observed in the clinic with different patient populations that really influenced that effectiveness of whether it's just physical therapy alone, or when you introduce these other alternative treatments, such as shockwave therapy or biologics. In that case, what other factors are at play to consider?

Karin Silbernagel: Well, I can start more from my perspective. I think that we have seen that there are subgroups of patients in people for Achilles tendinopathy, and we can see there are various things that are more affecting certain groups. Some people have a lot of fear of movement, more of the psychological factors and understanding. So, that may be education, understanding more of your fear and being able to not avoid activity because we think activity or loading is important. Then we also see more now that there are maybe one group that is more of an exercise, maybe overuse-induced versus some people that might be other personal factors and other things that's going on related to metabolic health and high blood pressure, high BMI, high blood sugar, and all those things too. We don't have the data yet, but maybe those things need to be addressed in the combination because that maybe that's why our exercise is not working well.

Neal Millar: Yeah. I think Karin's works really important in this area because we tend in medicine sometimes to want to treat every patient the same. As in we want the tick, but well sorry, that's modern medicine wants to treat everybody the same because it reduces costs. But that's not necessarily the best way.

I think much more personalized approach in tendon disease is really what is probably now required. When I just add to that, in my clinic in Glasgow, a lot of it is to do with socioeconomic status as well about what the patient has time to do. Do they have 2 jobs? Do they have 3 kids?

This is why treating tendons, it is important to really address those social aspects of the patient as well. When we're considering what treatment plan to really put them on.
[00:25:08] **Question 8: Are there any immediate healthcare disparities or inequities to accessing treatment?**

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[00:25:08] **Stephanie Cone:** Transitioning from that, [00:25:10] can we talk a little bit more about how patient demographics might influence both the incidence of [00:25:15] tendinopathies and compliance with any kind of clinical interventions? [00:25:20]

[00:25:20] **Neal Millar:** I can talk about certainly the working population that I treat as [00:25:25] in bricklayers, plumbers, people like that. They have busy jobs and trying to get them to [00:25:30] take on a physical therapy regime is difficult. Those types of patients have to be treated in a [00:25:35] much different manner, I think, than to say a recreational athlete or [00:25:40] somebody who has more time to do those sort of things.

[00:25:41] There's recent Dutch data to suggest that lower limb [00:25:45] tendinopathies are more prevalent than osteoarthritis. And osteoarthritis is one of the biggest [00:25:50] musculoskeletal burdens that is on healthcare systems. In the States alone, you [00:25:55] spend over $5 billion a year on treating rotator cuff tendon [00:26:00] problems, so it's a huge healthcare need.

[00:26:04] It's probably [00:26:05] healthcare need that isn't on the front pages a lot, but it is getting there and I think [00:26:10] that there are unfortunately disparities in the way people are treated. I think sometimes because it [00:26:15] hasn't been at the fore and because frankly, it's quite difficult to treat. [00:26:20]

[00:26:20] **Karin Silbernagel:** And I see the big issue since I do mostly lower extremity too, right?

[00:26:24] It's hard to [00:26:25] rest a lower extremity or just follow a loading program perfectly when you [00:26:30] have to walk for work. Or you have to get to work and you have to do what you need to do. The [00:26:35] conundrum the way I see it too is that we think people that have [00:26:40] maybe more of metabolic syndromes or other health problems that might actually [00:26:45] cause tendinopathy. And then we try to make them exercise, which then might [00:26:50] overload this tendon, right? So now we get painful tendons. So now they can't exercise, and we're [00:26:55] getting into this cycle. So, I think that is a big problem that we see with people who have [00:27:00] really problems for a long time.

[00:27:01] The other issue that I that I really tried to [00:27:05] educate too is that the earlier we can see somebody that has starting to [00:27:10] have tendon injury or tendon pain, the earlier the quicker we can help them kind of turn it [00:27:15] around. But people that don't have equal access or equal time and things to to [00:27:20] reach somebody, a healthcare professional that understand this injury. Or some people are just [00:27:25] dismissed that, oh, a little pain in your knee or a little pain in your Achilles doesn't really matter. You can still [00:27:30] work. You should still continue to work. Then we get to the point where we really have [00:27:35] a big injury, people can't move, and they can't work.
And we're getting it at the stage where if we could get it earlier, maybe we didn't even need to get there. So, I think those are the things that really coming with education and hoping that we can get to everybody a little bit earlier. That's a big problem when we see, especially with labor, and things too that they're coming way too late because they can either can't not stop working. Or people are not necessarily thinking that that's an important injury versus if it have an athlete, people think it's an important injury right away. That to me is something that I'm hoping that we can really educate and get people started and address earlier on.

**Question 9: How can patients take a more active role in their treatment plan?**

Can we as scientists, clinicians, etc. help patients navigate to legitimate therapies?

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**Jason Marvin:** This is a really great point, because when you think about it, rarely do we ever go to annual checkups and get tendon health evaluated. Never in my whole life. All of us in this room could name a family member, a friend, a colleague who described to you after a marathon how bad their joints feel, or after a climbing session and they definitely tore something. Recommendations are to go to physical therapy, and I know oftentimes people will just ignore those guidelines and go straight back into it. And then, of course, we see that manifest when it only deteriorates further in their health.

We've talked a lot about education and what you do with your patients. Outside of education, how can patients take a more active role in their treatment plan, or in this whole grand question of how do we get folks to get this checked out earlier than later before this disease has already progressed beyond a certain point?

Can we, as scientists, clinicians, etc., help these patients then navigate these more legitimate therapies, especially thinking about areas in the world where maybe there aren't as many available providers for them to seek out?

**Karin Silbernagel:** I'm involved in some consensus work. International consensus work trying to build on a consensus. Like, what should you evaluate? What are the important pieces both for research studies, but also clinically and clinical practice guidelines? And then now we're also looking at what is education, what education is out there, what is being pushed to individuals, and for those kind of things to kind of really improve the next step.

The problem sometimes with education too is that people always want a quick fix so sometimes the thing that people are getting excited about is not the thing that actually works in my opinion, right? People are rather eat a certain substance, or drink a certain things than do the exercises because I tell them to do that every day.
I think that's where the education and things really needs to get to. I also think that I've tried to push that too. I think tendinopathy is not purely a sports injury. I think it's a biological disease, just like osteoarthritis. The more we can get that understanding, I think the more also we need to educate people that are more in the general practitioners, or the first people to see somebody with pain that is just not being ignored and you just don't give anti-inflammatory and rest. I think there's a lot of work that we need to do there. I think that's at least when I'm doing these things and these talks, I think that's important.

Neal Millar: Yeah, I would agree with that. We need to be better at doing trials in the tendon world. We're not very good at that. If you look at major musculoskeletal diseases, such as osteoarthritis, rheumatoid arthritis, psoriatic arthritis, the trials done to help patients are very well-defined, have very good consensus on what the outcome should be. When we turn to the tendon world, we're very much quite behind in that arena for various reasons.

As Karin has said, we haven't been at the forefront maybe of funders or governments about how big a problem it is. So, when we are doing trials now, we need to really step up our game and make sure that we are including all patients like patient report outcomes, imaging. That we can look to scientifically to say, okay, when we introduce this treatment, we can make patients significantly better. Or equally are certain treatments, as you said earlier, Jason, are they not effective and really should we stop prescribing those alongside other things, other treatment methodologies as well.

Karim Silbernagel: I think really what we've talked about a lot too is that really aligning your outcomes with the purpose of your treatment. I think I'm afraid sometimes if you don't align - if you have a biologics and things are supposed to heal the tendon - and then you're only looking at physical activity or only pain. We might miss that it might have a benefit at the later stages. Or if you're doing something for pain, that's your goal of the treatment and then you're only looking at structure, we need to make sure that we align and align it for the right people. Because I'm sometimes getting worried that maybe we have some really good things that were out there due to poor clinical trials, it came out as not beneficial. And then we lost that.

Again, the subgroups that we're doing too, really thinking about who it works for. If not all tendon patients are the same, if they all respond differently. Then we have trials when everybody is involved. Then on average, we're not going to see any change even though it might be very beneficial for certain subgroups.

I think that's what we really need to work on and hopefully work on our funders, too. I think people that review grants that this is important as well.
[00:32:43] Question 10: As clinician scientists, what pressing questions are you most excited to tackle in the future, whether those be through your research and/or from a more clinical perspective?

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[00:32:43] Stephanie Cone: Awesome. That brings us into one more kind of the big research question, right? So, as clinician scientists, we're really interested in hearing about what pressing questions specifically you're most excited about tackling in the future, whether those are more in the research realm or more from a clinical perspective.

[00:33:01] Neal Millar: I'll say what keeps me excited and gets me out of bed in the morning is that I think there's a really great wealth of science, scientific data from the lab that we can translate into help patients. Okay, we have been quite poor in the tendon world understanding the science about why your tendons, why you get pain, why you get structural changes within the tendon. But we are figuring that out now, and we're doing it to the level that we're doing it in cancer, cardiovascular disease. We have really shifted as a scientific community towards helping dissect or helping figure that out for you, the patient, and what will come over the next 5 years are treatments.

[00:33:42] There will be biological therapies for specific subsets of patients, whether you have a rotator cuff problem. You maybe have had symptoms for 3 months and are not responding, that may be an avenue or treatment for you. There are other drugs being trialed in what I think are better trials.

[00:34:03] For me, that's the future is very promising and I'm glad because, treating tendon patients is tough. Being a tendon patient is hard and in that respect, we as clinicians haven't really changed very much over the years. And now I think, as Karin said, subsetting patients is hugely important. Understanding diabetes, molecular disturbance, metabolic disturbance, as well as novel treatments, new treatments, new drugs, or other avenues that could help those patients really is what excites me about the tendon field over the next 5 to 10 years.

[00:34:37] Karin Silbernagel: Yeah, I'm really excited about the work of others that are more of the basic science level, or biologics to see how we can merge that with the exercises that we're doing. How can we find the perfect mix of maybe biology can't be sped up, but maybe we can find the perfect environment. So we're going a lot smoother than it's doing now.

[00:34:59] I'm also very excited about that. I think that there are better ways to do the exercises and things that we're doing as well and maybe for whom. Maybe we need to start addressing more of other cardiovascular parts and see if we can address that with certain populations. Then we can get the exercises moving forward. I think there's a lot of things to do. I think that the patients are really excited for what we're doing.
We're very grateful for the patients really getting involved in what we're doing and kind of moving things forward. We have always a million questions. I think slowly but surely in combination with basic science researchers, with clinical researchers, and with patient partners to getting the patients involved in what are their problems, what are they looking at, and really trying to understand.

I think together we can move that forward too. I think the other part is, I think there is a lot of unexplained pains I'm pushing for maybe in knee osteoarthritis. Why are people still have pain? Well, nobody looked a lot of the tendons around, right? Are there other things and other areas? And we're really starting to see that people are looking at the hip.

Maybe it's not bursitis at the hip. It's probably the tendon that's a problem. And then if we think it's, that's the tissue, we might be able to treat it differently. So, I think it was starting to spread, and I'm really excited for the future in the combination with all the various types of scientists and things and especially for ORS meeting when you get a lot of various types of scientists together to really understand.

I'm hoping that all of you is going to come with really great things that I can do the exercises with and then we're all good.

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Jason Marvin: First of all, on behalf of the Public Outreach Committee and the ORS, we are so grateful for all of our speakers for joining us tonight and having this very candid, insightful discussion. I think it's really shed light into a lot of these open opportunities in the tendon field, and I hope that those who are listening may take this as the inspiration to maybe check out, perhaps, that tendon they feel could be injured, but they're waiting for it to get progressively worse before doing anything.

This could be their sign to go in, get it checked out. And I really think that as a junior investigator, as a postdoctoral fellow, it's been very inspiring to hear from both of your bodies of work and hearing your clinical perspectives. Really getting a sense of where we're going towards as a field and learning about more of some of the shortcomings as with funding and such.

Hopefully this conversation kickstarts a lot in the near future so that in the next 5 to 10 years, like Dr. Millar mentioned, we can get pushing on these therapeutic strategies and helping to bridge the basic sciences and clinical interventions much more. So with that, thank all of our speakers again, and thank you all for a great session tonight.