Transcript for Wearable Technology for Achilles Injury Recovery

Melanie Cole, MS (Host): Welcome to the podcast series from the specialists at Penn Medicine. I'm Melanie Cole. And today, I'm joined by Dr. Lorraine Boakye. She's the Director of Clinical Research, Foot and Ankle Division, and an Assistant Professor in the Department of Orthopaedic Surgery at Penn Medicine. And she's here today to highlight wearable technology for Achilles injury recovery.

Dr. Boakye, it's a pleasure to have you join us. Can you provide a little bit of a background on your role and an overview of what we're talking about today?

Dr Lorraine Boakye: Absolutely. So excited to be here and share a little bit about this. I'm really hoping that this can kind of change how we think about things. The Achilles tendon, in particular for rupture, in its recuperative process can be super complicated and we have some information to help guide how we're able to progress patients throughout their weight-bearing cycle.

So, when we think about how we're choosing to progress people, it's often really based on an aggregate of averages. We think about how patients are really loading the tendon and how much activity they're doing, sometimes without much direction from us. And so, it ideally provides us real objective data about how much the patient is actually providing a mechanical load to the tendon, and then will allow us to quantify this and determine how much they're doing so we can further fine tune the rehab process.

And as I mentioned, it's really based on milestones or clinical weeks from treatment, whether it's postoperative or date of injury. But ultimately, the goal is to have something that's low burden for the patient. So, something that offers us real-time data so that we can tinker with things on the back end.

Host: Well, thank you for that. So, tell us exactly what is this wearable technology and wearable tendon kinetics in general. Tell us about the goal of introducing these to postoperative Achilles tendon injury patients.

Dr Lorraine Boakye: This technology uses a common motion sensor. It's called an accelerometer, and that measures changes in velocity of the object that it's attached to. And in these cases, we secure the accelerometer onto the immobilizing boot that patients wear during their injury process. Then, you can take these accelerometers and use the measurements, and that really helps to

predict how much force is actually going through the tendon. It's really like a step by step measurement, so we can monitor it throughout the course of the day. We've been doing some testing and healthy controls, and we have a sense of what it looks like when a patient is doing something, whether it's walking upstairs versus walking on flat land or takes their boot off and doesn't actually have it on. So, it's helpful for us to be able to see variations in day-to-day activity, but then also each individual step measurements over the course of their treatment protocol.

Host: So, you've mentioned load-bearing a couple of times. Speak about the implications regarding weight-bearing protocols and the value of investigating tendon loading patterns. How does that all tie together for these implications for rehab?

Dr Lorraine Boakye: Absolutely. I think these rehabilitative efforts can be a little bit confusing for patients in obviously a prolonged period of time. So, several weeks out from surgery, it's really crucial that the patient has a good idea of what's expected, but then also that we have on our end, kind of an understanding of how they're progressing. And so, using this objective data is more able to be vetted than hearing what patients are telling us they do, which is really how we're managing it now. Ultimately, I think this really allows us to have the most objective sense of how things are progressing. There's not a good way to actually biopsy the tendon or get a sense of real time dynamic measurements when they're loading. So, understanding the individual gait profiles is honestly one of the best surrogates that we've been able to come up with. And ideally, this really allows us to adjust PT protocols, and really think about what activity level and what loading patterns are the most associated with best outcomes.

Host: How are you collecting your data? And is this research unique to the McKay Orthopaedic Research Laboratory at Penn Medicine?

Dr Lorraine Boakye: From my understanding, this is really the first of its kind in the Achilles rupture population. The way it works is at one of their postoperative visits, we attach the little loading sensor to their boot and they get to go about their business. Ideally, it's not obtrusive and they don't really have to think about it. And at a prescribed time, we have them send them back, but we're able to get the data in a reasonably real time manner so that we can continue to monitor.

I'd like to add that we do have active collaborations with researchers at the University of Delaware who have expertise in physical therapy and

rehabilitation, and at Carnegie Mellon University, and those folks have expertise in deep learning. And the goal is to develop better strategies to implement patient protocols and use those algorithms to predict other clinically relevant parameters.

Host: Is there anything else about this wearable technology or the research happening at the McKay Orthopaedic Research Laboratory that you'd like to share? Because this is very interesting and I think that other providers really would find this research fascinating and want to follow along.

Dr Lorraine Boakye: Really, the goal of our research and the McKay lab in general is to understand the clinical manifestations of the biomechanic underpinnings, so I can kind of say why we're having someone progress from using crutches immediately after surgery to not using crutches two to four weeks out based on real data, and looking at the evidence behind it and really using the understanding of what's happening to the tendon versus the general prescription. So, ideally, we've got really evidence-based clinical paradigms that really allow us to personalize and individualize care and optimize outcomes.

Host: Thank you so much, Dr. Boakye, for joining us today and sharing this research for other providers. And to refer your patient to Dr. Boakye at Penn Medicine, please call our 24/7 provider-only line at 877-937-PENN, or you can submit your referral via our secure online referral form by visiting our website at pennmedicine.org/refer-your-patient. That concludes this episode from the specialists at Penn Medicine. I'm Melanie Cole. Thanks so much for joining us today.