

[MUSIC PLAYING]

KENDALL LEE: Hello my name is Dr. Kendall Lee. I'm the director of engineering here at the Mayo Clinic. My team and I were truly excited to be presenting this paper to you that is coming out of the Mayo Clinic proceedings, entitled Enabling Task-Specific Volitional Motor Function via Spinal Cord Neural Modulation in a Human With Paraplegia. We're very excited to present this paper. This paper was done in collaboration with Dr. Reggie Egerton's team at UCLA, as well as Dr. Kristen Zhao's team here at the Mayo Clinic. This study demonstrates that the use of epidural electrical stimulation in a patient who has complete thoracic spinal cord injury, ASIA A, meaning that it was both motor and sensory complete, that the patient using epidural stimulation was able to get volitional movement control back of his lower extremities

In addition, we've also demonstrated that the patient could stand following the epidural stimulation. The first author on this paper was Dr. Peter Grahn, who will be explaining more of the details of the findings in this paper.

PETER GRAHN: So my name is Dr. Peter Grahn and I am an engineer at the neural engineering lab here at Mayo Clinic, and I'm working on a project, a clinical trial where we're using epidural electrical stimulation of the spinal cord to enable volitional control of motor function after current paralysis. So our findings are novel in that we'll first showing replication at such an early time point just during the first eight days of stimulation, but then our second finding this novel is that rhythmic, step-like movements can be volitionally controlled, so initiated, modulated in their amount of movement and then terminated volitionally. It's been shown that rhythmic activity can be elicited using epidural stimulation but that this activity is not controlled volitionally by the subject.

KRISTIN ZHAO: Hi. I'm Kristin Zhao, Director of the Assistive and Restorative Technology Laboratory in the Rehabilitation Medicine Research Center, and I am co-PI on this project. Really, the PMNR portion of this study is the prehab, so the rehabilitation prior to the implantation of the stimulator, and that is about 21 weeks or 60 sessions. And then post-op, after the stimulator is implanted, we have another 38 weeks of rehabilitation, and this is comprised of overground training, so standing and stepping, if possible, and then, treadmill training.

So the goal of this project really is to replicate a study that was performed by UCLA and the

University of Louisville. And really, they've been critical in helping us to understand what they've done prior, what they did in their study with their protocols for rehabilitation, implantation, and then post-op therapy.

I think the results of this study are very promising. We're happy that the results are similar to the previous study, and we think we've successfully replicated up to this point. And we hope to continue working to understand the mechanisms of the data and the patient's recovery to date.

We have a team that's really successfully worked together, that consists of researchers from neural engineering and from rehabilitation medicine. And they've come together with both research backgrounds and clinical backgrounds to make this project a success.

IGOR LAVROV: My name is Igor Lavrov. I am an assistant professor in department of neurosurgery, and I am co-author of this paper. The subject on the study was very excited about neural process, and we definitely appreciate all his efforts and passion, being with us all this time and for on-call procedures and definitely, this excitement was shared within the whole team and subject.

We can definitely say that his recovery over those months is extremely going well. This study is definitely important for future clinical practice, and it gives hope to the patients, in terms of potential restoration of motor functions in those cases when clinically we identify complete injury. At the same time, there are more questions to answer. And this study still require more understanding of mechanisms behind orthotics.

KENDALL LEE: This is the first paper to show that, in the same patient, within the first two weeks following epidural stimulation, the patient was able to recover volitional control over the leg, as well as standing. This is truly exciting finding, and we hope that you enjoy the paper.

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