

# Back on my feet

Ton Arts, first tester of the MyoS uite Exoskeleton

When Ton Arts comes out of anaesthesia after surgery, he can only move his head. The rest of his body seems unresponsive. “I was panicking, of course”, says Arts, “but it was also a calculated risk. I had a double hernia and frequent failure symptoms, and the pain was getting worse. Before the operation, the doctors at the St. Maartenskliniek in Nijmegen told me that there was a significant risk of suffering a spinal cord injury. But I had no choice. Without the surgery, I could have ended up with a complete spinal cord injury over time.”

It was September 2014 when Arts, then 57, underwent the operation. After, it looked as if he would never be able to stand or walk again. “I had no control over my arms, I couldn’t move anything. My bowels and bladder were failing; everything was coming out. It was to do with the location of the spinal cord injury. I have a high spinal cord injury, level C4, in my neck. Everything in my body below that point is affected: the spinal cord is partially damaged, so the communication between my brain and my body is not optimal.”

## Testing the MyoS uit

For five months, Arts had to undergo rehabilitation treatment at the St. Maartenskliniek. He then had to undergo another four months of outpatient rehabilitation. Thanks to the rehabilitation and his perseverance, Arts is now slowly improving. “At one point, I regained feeling in my big toe. It felt like a small victory. I regained some strength and bladder and bowel control. Eventually, some of the sensation in my body and some control came back.” With some effort, Arts can now stand up again and walk a little bit. At home, he mainly uses the walker. Outside, with the help of crutches, he can walk a maximum of a hundred and fifty metres. Despite his limitations, he is not sitting idle.

He took part in a sailing camp, organised by the St. Maartenskliniek and the Handbike Battle in Austria. After seeing him in an educational video, rehabilitation specialist Ilse van Nes contacted him and asked if he’d like to test the MyoS uite: a soft exoskeleton, that helps people with incomplete spinal cord injuries to stand and walk again.

## Further improvement

“Of course”, says Arts, “I accept every challenge!” In early 2023, under the supervision of a physiotherapist at the St. Maartenskliniek, he started training twice a week, to get used to the robotic suit. On 21 March, he took it home for six weeks, and the real testing began. “The suit actively supports my walking movements, which is very nice. When I walk with crutches, I lean forward slightly. The suit pulls me upright, allowing me to roughly double my walking distance. I particularly benefit from this when I am outdoors. At home, it’s easier to use the walker. Because of my limited motor skills, putting on the suit with its Velcro fasteners is very difficult, and I need my wife’s help. To control the suit, you have to carry a six-pound battery on your back, which makes it uncomfortable to get into the car or sit in a chair.”

Testing the suit in practice provides a lot of valuable information. “When I cook, I hold on to the countertop and slide from side to side. This is hardly possible when wearing the suit, as it mainly supports forward movement, and not sideways sliding.”

“On the positive side, the display is very easy to use, and you can adjust many functions to suit your personal situation.” Arts hopes that his experiences and suggestions will be used to further improve the suit. “I can only applaud the development of innovative techniques to support people with spinal cord injuries!”

# Robotic rehab

Ilse van Nes, Rehabilitation specialist at St. Maartenskliniek, Nijmegen

“It is a fantastic time to be a rehabilitation physician”, says Ilse van Nes. “We can now use technology to help people with things they can’t do for themselves, or can’t do well. That’s a great benefit for spinal cord injury patients, and it’s very inspiring for a rehabilitation doctor to be involved in.”

Caring for patients with spinal cord injuries. This is what Ilse van Nes, rehabilitation physician at the Spinal Cord Injury Department of the St. Maartenskliniek has been doing since 2008. Some patients have a complete spinal cord injury, where the brain and body are no longer communicate. Other patients have an incomplete spinal cord injury, where part of the connection is still intact.

The effects of a spinal cord injury depend on where the damage is located. For example, a high spinal cord injury may also paralyse the arms, whereas a low spinal cord injury may only cause problems from the hips down. “In addition, a spinal cord injury has many ‘invisible’ effects”, says Van Nes. “Think of bladder and bowel problems, problems with sexuality, less skin sensation because nerve impulses don’t get through, disturbed body balance, and so on.”

## Encouraging exercise

Van Nes combines patient care and scientific research, which she believes is ideal, because the most important research questions arise during care. The St. Maartenskliniek is all about optimising chronic care. Van Nes: “One way we try to do this is through the comprehensive aftercare clinic, where the entire team examines all patients with a spinal cord injury every two years. We also look at ‘invisible’, secondary complications, such as a low bone density, possible wounds and infections, spasticity and bladder and bowel problems.” Another essential part of their approach is to get patients moving as much as possible. Exercise has health benefits

in almost every area. “So we strongly encourage patients to move”, says Van Nes. “We have done this so with a rigid exoskeleton in patients with complete spinal cord injuries. These patients cannot walk on their own, but with the help of such an exoskeleton and a lot of training, several people have managed to walk again.”

## Soft exoskeleton

Meanwhile, with a TopZorg grant from ZonMw, Van Nes and colleagues have also started their research on the MyoS uit, a soft exoskeleton that is considerably cheaper, more flexible and easier to use than the hard exoskeletons used for patients with complete spinal cord injuries. Van Nes: “Theoretically, some patients with incomplete spinal cord injury can put on such a MyoS uit themselves. We are investigating whether this is actually the case and whether the suit also leads to them walking more in their home environment.”

The St. Maartenskliniek has purchased four MyoS uits for this study. The participants will be able to try out the suit for six weeks, to experiment in their everyday environment. Do they use the suit, do they walk more and further, is it user-friendly enough, or do they quickly cast it aside? “We use sensors to monitor actual use”, says Van Nes. “And we conduct user interviews to find out what they like and dislike about the suit. These factors will determine its success. For the time being, anyone who wants to continue using the suit after the study is over, will have to buy it themselves. Dutch health insurance companies do not (yet) reimburse the purchase.”