Medical Xpress

Researchers work on device to let paralyzed limbs move

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Researchers are making progress in a quest to create a device that would allow people who have been paralyzed by injury or stroke to move their limbs.

The goal it to make such a device - which would be implanted in the brain and interpret brain signals - available for clinical trials in eight to 10 years.

Such devices "could be a game changer," said Rajesh Rao, director of the Center for Sensorimotor Neural Engineering at the University of Washington. "It would radically alter the way we might help people for stroke or spinal cord injury," he said.

The National Science Foundation granted the center $16 million over the next four years for its research. The center is led by the University of Waashington, and includes researchers from the Massachusetts Institute of Technology, San Diego State University and others.

The center was established in 2011 with an $18.5 million federal grant, and in the past four years its discoveries have laid the groundwork for technological advances that could bring the devices to market in the coming decade, Rao said. In five years, the center hopes to have evidence that it is feasible to implant such a system in animals and some human patients.

When the center was first established, he said, researchers were exploring several different areas, but did not have a focused mission. And there was some uncertainty over whether the National Science Foundation would continue to fund the research.

Rao took over as director in 2013 and focused the center's research on implantable brain devices that could help with stroke or spinal cord injuries, as well as progressive neurological diseases such as Parkinson's. That led to the renewal of the federal grant this year, he said.

Implantable devices would work by sending signals between regions of the brain or nervous system that no longer communicate with each other because of injury or stroke.

So far, the lab has developed "bidirectional" devices that can pick up brain signals, decode the information, and then send it to other parts of the nervous system. The goal is to create devices that create a new, artificial pathway, allowing information to bypass damaged parts of the brain or nervous system.

"It's a very targeted rehabilitation approach, as opposed to drugs or physical therapy," he said.

To make the device work properly, researchers must develop powerful algorithms that can correctly decipher brain signals and deliver the information to the appropriate region of the body, he said.

On the hardware side, researchers must create devices that can be embedded in neural tissue and not be rejected. Brain tissue tends to encapsulate embedded electrodes with scar tissue, which prevents them from functioning properly, Rao said.

And researchers must understand how the brain rewires itself after an injury, and how it might adapt to an artificial device.

The team includes computer science and engineering professors, and neuroscientists and neurosurgeons.

The research grant is also paying for studies on the ethics of using such devices. An implantable device that helps control movement might touch "fundamental issues of identity," Rao said. That issue has been raised by other types of implantable devices that treat neuropsychiatric disorders, such as depression.

In the lab, ethicists and philosophy professors are "constantly asking questions about the implications of the technology they're developing," he said.

Rao described the center's work as a joint venture between academia and industry.

The center is partnering with Medtronic, an Irish medical device company, which is also working with the the University of Washington on a brain stimulation device, a kind of pacemaker for the brain. The device would treat a nervous system disorder, essential tremor, which causes a rhythmic shaking in the hands.

The first generation of brain-stimulation devices constantly delivers electrical impulses to the brain - even when the patient is resting - draining the device's battery and leading to more surgeries to replace them.

Researchers at the center are working on a new generation of devices that can monitor the brain, and deliver targeted electrical stimulation only when needed.

Rao said researchers are also exploring ways to wirelessly power implantable devices, so their batteries don't have to be replaced.