Restoring Paretic Hand Function via an Artificial Neural Connection Bridging Spinal Cord Injury

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Functional loss of limb control in individuals with spinal cord injury or stroke can be caused by interruption of the neural pathways between brain and spinal cord, although the neural circuits located above and below the lesion remain functional. An artificial neural connection that bridges the lost pathway and connects brain to spinal circuits has potential to ameliorate the functional loss. Yukio Nishimura, Associate Professor of the National Institute for Physiological Sciences, Japan, and Eberhard Fetz, Professor and Steve Perlmuter, Research Associate Professor at the University of Washington, United States investigated the effects of introducing a novel artificial neural connection which bridged a spinal cord lesion in a paretic monkey. This allowed the monkey to electrically stimulate the spinal cord through volitionally controlled brain activity and thereby to restore volitional control of the paretic hand. This study demonstrates that artificial neural connections can compensate for interrupted descending pathways and promote volitional control of upper limb movement after damage of neural pathways such as spinal cord injury or stroke. The study will be published online in Frontiers in Neural Circuits on April 11.

"The important point is that individuals who are paralyzed want to be able to move their own bodies by their own will. This study was different from what other research groups have done up to now; we didn't use any prosthetic limbs like robotic arms to replace the original arm. What's new is that we have been able to use this artificial neuronal connection bypassing the lesion site to restore volitional control of the subject's own paretic arm. I think that for lesions of the corticospinal pathway this might even have a better chance of becoming a real prosthetic treatment rather than the sort of robotic devices that have been developed recently", Associate professor Nishimura said.

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