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Groundbreaking Treatments for Patients with Partial or Full Paralysis

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Paralysis is a life changing condition that can be caused by medical conditions like multiple sclerosis, but in many cases results from a traumatic accident or injury that leaves the person with a spinal cord, head, and/or brain injury. Repairing nerve and muscle damage or a break in the connection between the brain and the rest of the body is extraordinarily difficult and sometimes considered impossible. But new research and advances in technology are bringing hope to people who have been partially or fully paralyzed.

Depending on the type of injury, different surgical methods can be used to repair injured areas of the body. Peripheral Nerve Surgery is used to sew severed nerves back together or to apply a nerve graft to reconnect sensation and movement to an area. Another method is a muscle transplant to replace damaged muscle with working muscle from another area of the body, e.g., the thigh for the bicep. In cases where the brain has lost control of a part of the body due to spinal cord injury, new advanced research is being done with computers and implants to stimulate the brain function and restore movement. One such method is called functional electrical stimulation (FES) which uses electrical pulses to restore muscle function.

According to the Christopher and Dana Reeve Foundation, “the excitement around FES technology really sparked in 1983 when Nan Davis, a paraplegic student at Wright State University, got out of her wheelchair and “walked” to get her diploma.” But that event was for research show and tell –there was very preliminary data and limited functionality at that point in the research process. According to Davis the walk was a “computer-controlled electric stimulation, not me.” She then returned to her wheelchair and got on with life, later becoming a teacher.

FES research continued in different arenas and today is being used in the form of FES bikes for exercise; implants for bladder function and limited movement; and, most intriguing, in new research and clinical trials working on cognitive control of muscles through FES-type implants and treatments.

FES transplants stimulate muscles through implanted electrodes. This stimulation is limited because complex movements are very difficult to imitate. They require stimulation to multiple muscles from different paths in the brain. FES researchers are trying to identify the patterns of complex movement with computer systems. Keele University in the U.K. has partnered with the Cleveland FES Center for just this type of study. In a clinical trial on FES they implanted 24 electrodes into the muscles and

nerves of two patients with tetraplegia (aka quadriplegia) to try to restore arm and hand function. Computerized movement models were used to determine where to place the electrodes. The team worked with the patients on functional living tasks and achieved results. The patients were able to do the following alone: 1) scratch nose; and 2) shake hands. With some form of assistance they were also able to: 1) eat finger foods; 2) wash face; and 3) brush teeth. Eating with a fork was somewhat more difficult. These early and limited studies indicate that FES may at some point be used to restore movement to severely injured patients.

In 2014 UCLA released results from a study where they used epidural electrical stimulation to stimulate leg movement in spinal cord injury patients. They implanted electrodes along the spinal cord and stimulated them to allow those patients to move “legs, hips, ankles and toes.” In 2015 they went one step further to create a “non-invasive” study. Researchers used “transcutaneous spinal cord stimulation where they placed electrodes on a patient’s lower back and sent a unique pattern of electrical currents through the electrodes.” After repeated stimulations the patients were able to move their legs voluntarily. Researchers then added a drug called buspirone, which further assisted in movement. Lead researcher V. Reggie Edgerton, stated his belief that the treatment “reawakened’ dormant, but functioning, neural connections.” This is the goal of the original FES studies as well.

Although the implications of these studies are positive, it will take years before viable solutions are released to the market. The FDA has already approved some FES devices, like the bikes and bladder implants, however even these limited products are subject to insurance restrictions. The bikes for example cost an average of $15,000 and are not covered by Medicare. Nevertheless there is hope for future treatment.

In the meantime, anyone who is injured in an accident should seek immediate medical care and, if they have suffered any kind of spinal injury, they should also seek the advice of an experienced attorney familiar with insurance coverage issues. High level care for victims who suffer accidental head injury, spinal cord injury, and/or paralysis is lifelong and expensive. It is important to know your options at the beginning of the process to ensure you are getting the best care possible for your injury.

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