BIONIC HAND THAT CAN FEEL

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Those who have lost a limb such as a hand have long had the option of using a prosthetic to restore some lost functionality. Studies have shown that as many as 50 percent of prosthetic wearers rarely use them due to appearance and poor controllability.

A new breakthrough in prosthesis has delivered a bionic hand that is capable of feeling just like the organic limb it replaces. Developed by Silvestro Micera of the Ecole Porytechnique Federale de Lausanne (EPFL) in Switzerland, this new bionic hand could be the first step towards a world in which prosthetics deliver realistic sensory feedback to the brain via the nervous system. This new method is said to allow for signals to rush back and forth between the prosthetic and the nerves, creating sensations which are more realistic and are delivered much more quickly than previous methods.

Micera's new method works by clipping electrodes directly to two main nerves in the arm. These electrodes are then responsible for facilitating communication between the hand and the nervous system. The prosthetic uses them to relay messages to and from the brain via nerves in the arm, meaning the patient can direct it with their thoughts.

The device is controlled by electrodes that are implanted into the median and ulnar nerves, allowing signals to flow through the arm in both directions. The electrodes stimulate the patient's sensory system, allowing them to feel surfaces they touch and grasp objects accurately and safely.

By concentrating on trying to manipulate the hand, Pierpaolo Petruzziello, 26, could move the fingers, make a fist, hold objects such as a bottle of water, and was able to feel when needles pricked it. The device took just a few days for Mr Petruzziello to master and, by the end of the month, he was able to move the hand in the way that he wanted 95 per cent of the time.

"It could deliver two or more sensations,"' said Mr Micera "You could have a pinch and receive information from three fingers, or feel movement in the hand and wrist.

One of the unresolved issues is whether patients will be able to tolerate having such a limb attached to them ail the tune, or whether they would need to remove it periodically to give them a rest Another problem is how to conceal the wiring under the patient's skin to make them less obtrusive. The electrodes of the prototype hand to be fitted later this year will be inserted through the skin rather than underneath it but there are plans under development to place the wiring subcutaneously.

Unlike previous prosthetics, the i-litnb Ultra boasts five individually-powered articulating digits, as well as a fully rotatable thumb and wrist, enabling the user to perform a variety of complex grips.

The i-limb is the latest in "myoelectric prosthesis" - a process that uses electrical sensors to detect tiny muscular movements in the residual limb, which are then translated by an on-board computer into natural, intuitive movement of the mechanized hand.

In practice, this requires the wearer to learn a language of muscle movements around the wrist, which correspond to a vast array of pre-programmed hand and finger motions. Although it requires a fair bit of concentration to begin with. Gow says that - much like playing an instrument - the mechanism is intuitive once muscle memory takes over.

As well as the practical benefits afforded by the added range of grips, Gow believes the i-limb carries a significant psychological advantage because finger movements are what most people associate with the human hand.

As things stand, the i-limb is also prohibitively expensive. Including fitting and training, a hand costs in the region of $100,000. Perhaps in part because of this, most of the 4,000 or so i-limb users in the world are war veterans from Iraq and Afghanistan. Gow notes, however, that the potential market is huge: there are presently an estimated two million upper limb amputees across the globe.

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