Scientists: Man controlled robotic hand with thoughts

December 2 2009, By ARIEL DAVID , Associated Press Writer

This undated photo made available from the Bio-Medical Campus University of Rome on Wednesday, Dec. 2, 2009 shows at center Pierpaolo Petruzziello's amputated hand linked with electrodes to a robotic hand, seen at left, as part of an experiment, called LifeHand, to control the prosthetic with his thoughts. A group of European scientists on Wednesday announced they successfully connected a robotic hand to a man, Petruzziello, who had lost an arm in a car accident, allowing him to control the prosthetic with his thoughts and feel sensations in the artificial limb. The experiment lasted a month. But scientists say it marks the first time an amputee has been able to make complex movements using his mind to control a biomechanic hand connected to his nervous system. (AP Photo/Courtesy of Bio-Medical Campus University) TO BE USED ONLY IN CONJUNCTION WITH LIFEHAND PROJECT ARTICLES **

(AP) -- A group of European scientists said Wednesday they have successfully connected a robotic hand to an amputee, allowing him to

feel sensations in the artificial limb and control it with his thoughts.

The experiment lasted a month, and scientists say it was the first time a patient has been able to make complex movements using his mind to control a biomechanic hand connected to his nervous system.

The Italian-led team said at a news conference Wednesday in Rome that last year it implanted electrodes into the arm of the patient who had lost his left hand and forearm in a car accident.

The prosthetic was not implanted on the patient, only connected through the electrodes. During the news conference, video was shown of 26-year-old Pierpaolo Petruzziello as he concentrated to give orders to the hand placed next to him.

"It's a matter of mind, of concentration," Petruzziello said. "When you think of it as your hand and forearm, it all becomes easier."

During the month he had the electrodes connected, Petruzziello learned to wiggle the robotic fingers independently, make a fist, grab objects and make other movements.

"Some of the gestures cannot be disclosed because they were quite vulgar," joked Paolo Maria Rossini, a neurologist who led the team working at Rome's "Campus Bio-Medico," a university and hospital that specialize in health sciences.

The euro2 million ($3 million) project, funded by the European Union, took five years to complete and produced several scientific papers that have been published or are being submitted to top journals, including Science Translational Medicine and Proceedings of the National Academy of Sciences, Rossini said.

Experts not involved in the study told The Associated Press the experiment was an important step forward in creating an interface between the nervous system and prosthetic limbs, but the challenge now is ensuring that such a system can remain in the patient for years and not just a month.

"It's an important advancement on the work that was done in the mid-2000s," said Dustin Tyler, a professor at Case Western Reserve University and biomedical engineer at the VA Medical Center in Cleveland, Ohio. "The important piece that remains is how long beyond a month we can keep the electrodes in."

After Petruzziello recovered from the microsurgery he underwent to implant the electrodes in his arm, it only took him a few days to master use of the robotic hand, Rossini said. By the time the experiment was over, the hand obeyed the commands it received from the man's brain in 95 percent of cases.

Petruzziello, an Italian who lives in Brazil, said the feedback he got from the hand was amazingly accurate.

"It felt almost the same as a real hand. They stimulated me a lot, even with needles ... you can't imagine what they did to me," he joked with reporters.

While the "LifeHand" experiment lasted only a month, this was the longest time electrodes had remained connected to a human nervous system in such an experiment, said Silvestro Micera, one of the engineers on the team. Similar, shorter-term experiments in 2004-2005 had hooked up amputees to a less-advanced robotic arm, and patients were only able to make basic movements, he said.

Experts around the world have developed other thought-controlled

prostheses. One approach used in the United States involves surgery to graft shoulder nerves onto pectoral muscles and then learning to use those muscles to control a bionic arm.

While that approach is necessary when the whole arm has been lost, if a stump survives doctors could opt for the less invasive method proposed by the Italians, connecting the prosthesis to the same system the brain uses to send and receive signals.

"The approach we followed is natural," Rossini said. The patient "didn't have to learn to use muscles that do a different job to move a prosthesis, he just had to concentrate and send to the robotic hand the same messages he used to send to his own hand."

It will take at least two or three years before scientists try to replicate the experiment with a more long-term prosthesis, the experts said. First they need to study if the hair-thin electrodes can be kept in longer.

Results from the experiment are encouraging, as the electrodes removed from Petruzziello showed no damage and could well stay in longer, said Klaus-Peter Hoffmann, a biomedical expert at the Fraunhofer-Gesellschaft, the German research institute that developed the electrodes.

More must also be done to miniaturize the technology on the arm and the bulky machines that translate neural and digital signals between the robot and the patient.

Key steps forward are already being made, Rossini said. While working with Petruzziello, the Italian scientists also were collaborating on a parallel EU-funded project called "SmartHand," which has developed a robotic arm that can be directly implanted on the patient.