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Pitt stem-cell procedure gives hope for regrowing limbs

By Brian Bowling
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Regaining a quarter-inch of his missing left index finger makes playing a human guinea pig worthwhile for Army Staff Sgt. Shilo Harris.

The first soldier to volunteer for an experimental procedure pioneered by a Pittsburgh researcher, Harris said he knows most people aren't impressed with his new stub but it represents progress for soldiers maimed in combat.

"If we gain anything, that's something," said Harris, 33, of Coleman, Texas.

The U.S. Army Institute for Surgical Research in Fort Sam Houston, Texas, is working with the University of Pittsburgh's McGowan Institute for Regenerative Medicine on a long-term project to regrow soldiers' limbs. Harris volunteered for a project using a stem-cell method pioneered by Dr. Stephen Badylak, director of tissue engineering at the McGowan Institute.

Harris was a truck commander in the 1st Squadron, 89th Cavalry, 10th Mountain Division. On Feb. 19, 2007, during routine patrol searching for roadside bombs in southern Baghdad, his truck found one the hard way.

The blast killed his gunner and two dismounted soldiers, and the resulting flames seemed destined to kill him and the driver.

"They pretty much thought I was dead because they could see me in the cab of the truck surrounded by fire," Harris said.

He kicked the door open and got out, shedding his burning clothing before he collapsed. Another soldier pulled him to safety when the heat started setting off ammunition in the truck.

"He shielded me with his body and got me back with the other trucks," Harris said.

Harris suffered a broken collarbone and third-degree burns across 35 percent of his body -- his upper torso, face and right arm. Doctors amputated both of his pinky fingers and his left index finger and put him into a coma that lasted 45 days.

Badylak's method uses a powder made from the extracellular matrix that keeps cells in place in a pig's bladder. Sprinkled on the reopened base of Harris' index finger, the matrix attracted his body's stem cells to the site.

Although adult stem cells aren't as versatile as embryonic stem cells, they can develop into different types of tissue. The Food and Drug Administration has approved the use of the powder in several medical procedures, mostly dealing with regrowing sections of uniform tissue such as organ walls and the esophagus. This is the first clinical test involving a complex structure.

Badylak said the powder can stimulate growth that replaces scar tissue with flesh that has blood circulation and feeling. In Harris' case, medical imaging shows the seven-millimeter growth -- equal to the thickness of four quarters -- contains different types of tissues, but that doesn't mean it has replicated the finger's structure.

"We're not fooling ourselves. That's not happening here," he said.

Another research team is studying genetic triggers needed to persuade stem cells to grow into bone, muscle and other tissues of a finger, arm or leg segment.

"We need to figure out what prompts them to go down the right path," Badylak said.

There's the further obstacle of regenerating the more complicated structures such as knuckles, ankles and wrists. Badylak said it would take several breakthroughs to reach the ultimate goal of regrowing arms and legs, but he believes they'll do it.

Even a modest regeneration can improve soldiers' lives. Harris said the extra quarter-inch has improved his left hand's grip and could enable him to at least wear a cosmetic prosthetic finger.

Harris wore a brace during the procedure that limited use of his left hand. He was initially reluctant to volunteer for a second treatment because losing the use of his hand inhibits his independence.

"It feels like you're going back to square one," he said.

Now, he's curious to see whether a second treatment would produce even more growth than the first, because it would be acting on younger flesh.

"I'd like to see this thing through and see how much more we can get out of it," Harris said.

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