MedicalXpress

Regenerative medicine improves strength and function in severe muscle injuries

July 21 2016

Results of a study conducted by researchers at the University of Pittsburgh School of Medicine and the McGowan Institute for Regenerative Medicine showed significant improvement in strength and range of motion, as well as evidence for skeletal muscle regeneration, in 13 patients who were surgically implanted with bioscaffolds derived from pig tissue to treat muscle injuries. The patients had failed to respond to conventional treatment before use of the extracellular matrix (ECM). The findings were published online today in *npj Regenerative Medicine*.

"Previously, there was no effective treatment for these patients, but this approach holds significant promise," said senior investigator Stephen F. Badylak, D.V.M., Ph.D., M.D., professor of surgery at Pitt and deputy director of the McGowan Institute, a joint effort of Pitt and UPMC. "This approach could be a game changer and not just an incremental advance."

For the Muscle Tendon Tissue Unit Repair and Reinforcement Reconstructive Surgery Research Study, which was sponsored by the U.S. Department of Defense, 11 men and two women who had lost at least 25 percent of leg or arm muscle volume and function first underwent a customized regimen of physical therapy for four to 16 weeks.

Lead study surgeon J. Peter Rubin, M.D., UPMC Professor and Chair of Plastic Surgery, Pitt School of Medicine, then surgically implanted a

"quilt" of compressed ECM sheets designed to fill in their injury sites. Within 48 hours of the operation, the participants resumed physical therapy for up to 24 additional weeks.

By six months after implantation, patients showed an average improvement of 37.3 percent in strength and 27.1 percent in range of motion tasks compared with pre-operative performance numbers. CT or MRI imaging also showed an increase in post-operative soft tissue formation in all 13 patients.

"For well-selected patients with this type of loss, we now have a treatment available to help improve their function," Dr. Rubin said.

The new data builds upon a previous Pitt study that showed damaged leg muscles grew stronger and showed signs of regeneration in three out of five men whose old injuries were surgically implanted with ECM derived from pig bladder. Those patients also underwent similar pre- and post-operative physical therapy.

The recent results included more patients with varying limb injuries; used three different types of pig tissues for ECM bioscaffolds; investigated neurogenic cells as a component of the functional remodeling process; and included CT and MRI imaging to evaluate the remodeled muscle tissue.

"The three different types of matrix materials used all worked the same, which is significant because it means this is a generic property of these materials and gives the surgeons a choice for using whichever tissue they like," Dr. Badylak said. "Prior to the surgery, each patient went through physical therapy focused on getting them to the point where they couldn't get any better. We then started active rehab 24 hours after surgery, which proved to be critically important for these patients."