Active after Injury:  
Understanding How Orthopedic Tissues Heal

Jason T. Shearn, PhD

In 2008, over 110 million patients in the U.S. were treated for soft tissue musculoskeletal injuries, including damage to the anterior cruciate ligament (ACL) and Achilles tendon (AT). Despite the frequency of these injuries, successful repair is still a big challenge. In two NIH-funded projects, Dr. Jason Shearn and his group are working to better understand and improve treatment for ligament and tendon injuries—to reduce pain, restore function, and prevent long-term abnormalities.

ACL Repair

Traumatic injury to the ACL greatly alters the knee joint and can increase a person’s risk of osteoarthritis. While surgeons can reconstruct the ACL and return patients to their daily activities, many studies show that ACL reconstruction often fails to restore normal rotational kinematics and can lead to long term joint degeneration. Therefore, Shearn and colleagues are using robotics to simulate daily living activities on ACL reconstructed knees and to determine changes in the articular cartilage structure and biomechanics. Their goal is to develop novel ACL reconstruction strategies to slow or avoid the development of osteoarthritis.

Tendon Repair

While repair of Achilles tendon injuries are usually successful in the short-term, ultrasound images of AT repairs after ten years show that abnormalities often persist. Currently, treatments for tendinopathy focus on relieving pain, so underlying issues such as tendon architecture or collagen fibril distribution remain altered. Shearn and his lab are working to design therapies that will enhance a tendon’s biomechanical properties. They are examining how tissue engineered constructs (TECs) affect and stimulate the natural healing process with hopes of producing tendon repairs that match normal tendon stiffness and hold up longer to daily forces.

Current ACL reconstruction uses a replacement tendon graft, which can eventually result in problems such as limited strength or slow filling of the harvest site.
More about Dr. Jason Shearn

Shearn, an associate professor in Biomedical Engineering and Orthopedic Surgery, has been teaching and researching at UC for over ten years. His research, which has garnered over $8 million in funding support, seeks to create better tissue engineered constructs for implantation and to understand the mechanical environment for normal, injured, and repairing tendons and ligaments.

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