Medical Imaging

Non-Invasive Device for Measuring Stress in Tendons, Ligaments and Muscles

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WARF: P150362US01

Inventors: Darryl Thelen, Jack Martin, Matthew Allen, Daniel Segalman, Laura Slane

The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a new device and method for quantitative measurement of stress in tendons, ligaments and muscles *in vivo*. The researchers have shown that 'wave speed' in tendons can be measured using their new, wearable sensor system and used to infer the tension in tissue, potentially averting injury to athletes.

Overview

Measuring muscle and ligament stress is crucial in rehabilitative medicine and medical research. Using this data, clinicians and researchers can develop treatment plans and new technologies to improve outcomes and speed recovery.

However, some techniques for gathering this data are highly invasive and involve threading a fiber optic sensor through the tissue or inserting a transducer in the tissue. Current noninvasive procedures are indirect and make assumptions about different tissues to estimate internal stress from external force.

The Invention

UW–Madison researchers have developed a new device and technique for dynamically, noninvasively and accurately measuring longitudinal stress in tendons, muscles and ligaments *in vivo*.

The inventors use skin-mounted accelerometers to measure transverse wave speeds in superficial tissues under time-varying loading scenarios. Such wave speed propagation metrics are then used to determine tissue stress based on a wave propagation model.

Applications

- Sports medicine and athletic injury
- Rehabilitative medicine
- Connective tissue diagnostics
- Research on tension bearing tissues like tendons

Key Benefits

- Non-invasive
- Provides accurate, *in vivo* measurements
- Enables quantitative rather than qualitative interpretation when diagnosing or treating borderline injuries of muscle and connective tissue
- Allows real-time analysis of tissue stress when patients are performing functional tasks like walking, climbing stairs or lifting weights
- Will likely ease diagnoses and reduce need for specialized input

Stage of Development

The researchers have met with UW Athletics staff as well as physical therapists, athletic trainers and strength coaches of an NBA team to discuss the potential for this kind of testing of high - level athletes, with an eye towards injury prevention and assessment of recovery.

The development of this technology was supported by WARF Accelerator. WARF Accelerator selects WARF's most commercially promising technologies and provides expert assistance and funding to enable achievement of commercially significant milestones. WARF believes that these technologies are especially attractive opportunities for licensing.

Additional Information

For More Information About the Inventors

- Darryl Thelen
- Matthew Allen

Related Technologies

- For more information about improved imaging techniques in tissue analysis, see WARF reference number P140270US01.

Publications

- Slane L. C., Martin J., DeWall R., Thelen D. and Lee K. 2017. Quantitative Ultrasound Mapping of Regional Variations in Shear Wave Speeds of the Aging Achilles Tendon. Eur. Radiol. 27, 474–482.
- Franz J. R. and Thelen D. G. 2016. Imaging and Simulation of Achilles Tendon Dynamics: Implications for Walking Performance in the Elderly. J. Biomech. 49, 1403–1410.

- Read a news story about this technology.

Tech Fields

- Medical Imaging : Ultrasound

For current licensing status, please contact Jeanine Burmania at jeanine@warf.org or 608-960-9846