Measurement of Stress, Strain and Stiffness in Functionally Loaded Tissues

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WARF: P08157US

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a system and method to directly measure stress, strain and stiffness of functionally loaded tissues.

OVERVIEW

Tissue stresses and strains are important measures of biomechanical function. Tissue stiffness aids in determining whether tissue is healthy, damaged, healing or pathological in some other way. Ultrasound "acoustoelasticity," as described by WARF reference number P06115US, provides a method of computing material properties using mathematical relationships between sound propagation and material properties.

This technique allows the determination of axial strain but not axial stress or stiffness. Although it is possible to measure axial properties by shifting the direction of the tranducers used along the axis of measurement, this solution is not practical with *in situ* tendons and ligaments. A method is needed to directly measure stress, strain and stiffness of functionally loaded tissues, which are orthogonal to the principal direction of the transducer system.

THE INVENTION

UW-Madison researchers have developed an apparatus and technique that can provide axial properties of material when only lateral access is available for ultrasound probes. The device provides a transverse directed ultrasonic transducer that determines transverse properties using the acoustoelastic techniques described in WARF reference number P06115US. The inclusion of a pair of angled transducers, one of which is a transmitter and the other a receiver, provides an angled measurement of both transverse and axial properties. Mathematical combination of these two measurements allows extraction of isolated axial properties.

THE WARF ADVANTAGE

Since its founding in 1925 as the patenting and licensing organization for the University of Wisconsin-Madison, WARF has been working with business and industry to transform university research into products that benefit society. WARF intellectual property managers and licensing staff members are leaders in the field of university-based technology transfer. They are familiar with the intricacies of patenting, have worked with researchers in relevant disciplines, understand industries and markets, and have negotiated innovative licensing strategies to meet the individual needs of business clients.

APPLICATIONS

- Determination of non-linear tissue stiffness from multiple levels of tissue loading as well as the stress and strain in the tissue at each level of loading
- Applicable to materials other than soft tissues

KEY BENEFITS

- Returns stress, strain and stiffness measurements in real-time without requiring extensive image analysis as with elastography
- Expandable to measure more complexly loaded tissues in multiple directions
- Non-invasive, low-risk procedure using relatively inexpensive instrumentation

ADDITIONAL INFORMATION

Related Technologies

For more information about acoustoelastic extraction of strain and material properties in the axial direction, see WARF reference number P06115US.

For more information about ultrasonic strain measurements of soft tissue, see WARF reference number P03347US.

Tech Fields

Medical Imaging - Ultrasound

CONTACT INFORMATION

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