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# Portable Device for Diagnosis and Monitoring of Rotator Cuff Disease (2012-106)

*Quantitatively assesses joint function for diagnosis and monitoring of rotator cuff injury*

## Market Overview

This device utilizes ultrasound imaging to diagnose and monitor rotator cuff injuries. Each year there are over three million new cases of rotator cuff disease. Among those affected, more than half the population over 60 suffer from rotator cuff disease. Shoulder injuries, and particularly rotator cuff disease, can be difficult to diagnose. To give an accurate diagnosis, one must know the angular force and positional measurements of the shoulder. Current technologies generally give only one of these measurements, and while they can be used in concert with one another, it is difficult to accurately fit the pieces together. To solve this issue, Clemson University researchers have developed a portable device for diagnosing and monitoring rotator cuff disease which provides all the necessary measurements to make a diagnosis. The device integrates with ultrasound imaging and uses mechanical sensors to detect angle, inclination, and position, thus providing an accurate diagnosis for rotator cuff injuries.

## Application

Rotator cuff injury diagnostics; diagnostic medicine

## Stage of Development

Working prototype and clinical validation started

## Advantages

- Detects force, imaging and positional data, providing in-depth measurements that enhance diagnosis of rotator cuff injuries
- Retrofits to existing ultrasound systems, allowing for easy integration
- Provides real-time quantitative assessment of joint health, reducing time and cost of diagnosis

## Technical Summary

Clemson University researchers have developed a device which can measure the biomechanics of soft-tissue and joint stiffness for the diagnosis of rotator cuff injuries. The device frame universally fits to existing ultrasound transducers and works by measuring the force that is applied by the ultrasound probe to the underlying tissue while simultaneously displaying ultrasound images of the tissue. By combining angular force, imaging, and positional data, the device can provide an accurate diagnosis in real-time, reducing time and cost for the patient.

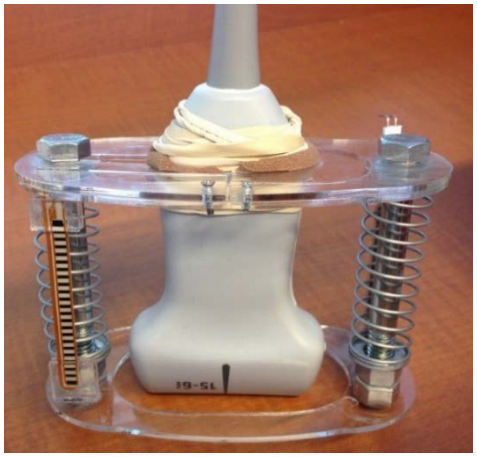

Figure 1: Working prototype shown is device coupled with an existing ultrasound transducer

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| App Type | Country | Serial No. | Patent No. | CURF Ref. Number | Inventors |
|---|---|---|---|---|---|
| Utility | United States | 14/034,756 | NA | 2012-106 | Delphine Dean, David Kwartowitz, Fuad Mafleh, Erika Trent, Vipul Raiker |

## About the Inventors

Dr. Dean is the Gregg-Graniteville Associate Professor in the Department of Engineering at Clemson University. She earned her Ph.D. in Electrical Engineering and Computer Science from MIT. Prior to joining Clemson, Dr. Dean was a Postdoctoral Associate at MIT. She's received numerous awards, including the Award of Distinction from Clemson National Scholars Program in 2013. She also has several utility patent applications pending. Her research interests focus on nano- to micro-scale characterization of biological tissues, force microscopy and mathematical modeling such as finite element analysis.

Dr. David Kwartowtiz is an Assistant Professor in the Department of Bioengineering at Clemson University. He earned his Ph.D. in Biomedical Engineering from Vanderbilt University. Prior to joining the Clemson faculty, Dr. Kwartowitz completed a postdoctoral fellowship at Mayo Clinic. Currently, Dr. Kwartowtiz is the Principal Investigator of the Clemson University Technology guided-Therapy for Endoscopic and Robotic Surgery (CUTTERS) lab. His research interests focus on image-guided surgery, robotics, and medical imaging.

## For More Information

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