Radiographic Strain Indicators to Non-Invasively Measure Implant Healing (2015-038)

Non-Invasive Measurement of Orthopedic Implant Strain to Assess Healing using Strain Indicators and Sensors

Market Overview

This orthopedic plate strain indicator non-invasively measures and assesses fracture healing and bone fusion. Every year there are approximately two million fracture fixations in the U.S. While medical implants and plates are usually robust, infection and healing assessment are still significant concerns. It is currently difficult to access when bone has healed sufficiently to allow weight bearing, especially as it varies greatly from patient to patient due to age, health, injury type, and other risk factors. There is a need for in situ monitoring of implant infection because infection is a complication in 20 percent of implant surgeries, and it is sometimes difficult to diagnose infection because it is localized to the implant surface. Clemson University Researchers have developed a non-invasive orthopedic plate strain indicator which utilizes a simple and robust readout that only requires passive sensing and can be easily adapted into the current surgical workflow for the evaluation of fracture healing and bone fusion.

Application

Measure and assessment of bone healing

Stage of Development

Preliminary Proof of Concept

Advantages

- Uses of in-situ ruler and chemical sensors, providing passive sensing and non-invasive assessment
- Provides a simple and robust readout, allowing tool to be easily adopted into current orthopedic workflow

Technical Summary

This approach to measuring implant strain uses an orthopedic plate that indicates strain by using a radiographical indicator that can be analyzed using an x-ray, MRI, MPI, or ultrasound. There is also a chemical sensor based upon measuring swelling that is used to monitor infection, addressing the need to measure chemical concentrations (e.g. glucose and pH) non-invasively through tissue, to provide an indication of infection, necrosis, and other conditions. A pressure sensor is also incorporated to measure pressure in inaccessible organs in the body after operation via an x-ray sensor.

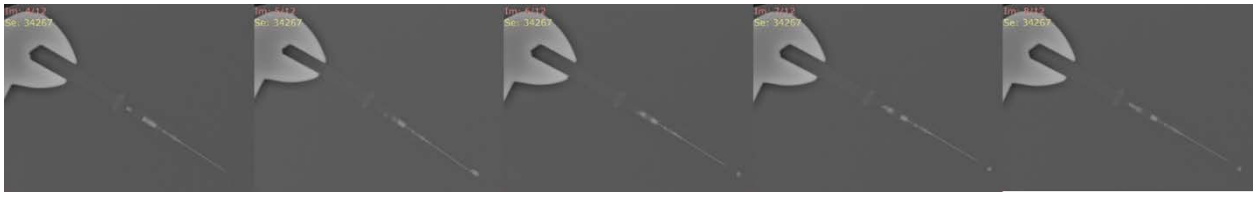

Figure 1: Radiographic pressure measurement

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App Type	Country	Serial No.	Patent No.	CURF Ref. Number	Inventors
Provisional	United States	62/204/111	NA	2015-038	Jeffrey Anker, John DesJardins, Caleb Behrend

About the Inventors

Dr. Jeffrey Anker is an Assistant Professor in the Department of Chemistry at Clemson University. He earned his B.S from Yale University and his Ph.D. from the University of Michigan where he worked on magnetically modulated fluorescence-based sensors. Before joining Clemson University, Dr. Anker was an NIH Postdoctoral Fellow at Northwestern University. He is currently a member of the Center for Optical Materials Science and Engineering Technologies (COMSET). Dr. Anker has an issued patent and several other applications in prosecution. His research interests focus on optical spectroscopy and nanoparticle devices to study chemical and bioanalytical processes.

Dr. John DesJardins is an Assistant Professor of Bioengineering at Clemson University. He earned his Ph.D. in Bioengineering from Clemson University and possesses over 20 years of experience as a biomechanical research engineer. He currently serves as the director of the Laboratory of Orthopedic Design and Engineering at Clemson University as well as the Frank H. Stelling and C. Dayton Riddle Orthopaedic Education and Research Laboratory at CUBEInC. Dr. DesJardins holds two issued patents and several U.S. and foreign applications. His research interests focus on total joint replacement, orthopaedic biomechanics, and biomaterials.

For More Information

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