Orthopedic Method and Device that Measures Dynamic Contact Pressure and Area in Artificial Joint Implants (2003-001)

An integrated sensor and measurement method to measure contact pressure in joint designs

Market Overview

This orthopedic method and device quantifies contact stress and contact area in total joint replacements. The American Academy of Orthopedic Surgeons has reported that annual hip and knee joint replacements have risen to over 2 million procedures within the United States alone. These implants have a typical lifespan of 10 years before needing to be replaced due to the wearing of polymer contact surfaces. In order to improve implant design to increase longevity, data from the pressure and contact area sensors in the implants can be used to understand how to decrease wear and tear. Yet, the presence of sensors consisting of foreign material severely alters contact pressure readings and cannot accurately record dynamic measurements. Clemson University researchers have developed an orthopedic method and device that incorporates contact sensors into hip and knee joint replacements, allowing for more accurate estimates of wear and tear and paving the way for more effective implant designs.

Technical Summary

This material is a novel pressure sensing variant of existing artificial joint load bearing material, allowing for direct evaluation of dynamic contact stress without modification of the implant material properties or geometry. This invention integrates the sensor into the joint surface allowing for dynamic, anatomically realistic, contact pressure and area measurements as well as preventing damage during realistic loading. Leveraging these sensors and measurement methods, load-bearing polymer implant surfaces can be further optimized to provide maximum resistance to wear with increased time to replacement.

Application

Orthopedic, Hip and Joint Replacement, Biomedical

Development Stage

TRL9: Commercialization

Advantages

- Direct joint surface integration, preventing inaccurate dynamic measurement readings
- Realistic simulation potential, improving implant design data
- Damage resistant, allowing for long-term measuring

App Type	Country	Serial No.	Patent No.	CURF Ref. No.	Inventors
Utility	United States	12/966,257	8,234,929	2003-001	Dr. Martine LaBerge Dr. Andrew Clark
	United States	11/058,433	7,849,751	2003-001	Dr. Martine LaBerge Dr. Andrew Clark

About the Inventor

Dr. Martine LaBerge

Professor and Chair of the Department of Bioengineering at Clemson University

Martine LaBerge serves as a Professor and Chair of the Department of Bioengineering at Clemson University and the founding Executive Director of the Biomedical Engineering Innovation Campus (CUBEInC) in Greenville, South Carolina. She earned her Ph.D. in Biomedical Engineering from the University of Montreal and completed postdoctoral work in Mechanical Engineering at the University of Waterloo. Her current research focuses on total knee implants, tribology, and endovascular stents. LaBerge's achievements include earning the South Carolina Governor's Award for Scientific Awareness, acting as the President of the Society for Biomaterials (SFB) and receiving its Inaugural Service Award, and being named a Fellow of the American Institute for Medical and Biological Engineering (AIMBE) and the Biomedical Engineering Society. She has also served as the Secretary and Treasurer of the AIMBE Academic Council and past Board Director of the Biomedical Engineering Society, SCBio, and the Clemson University Research Foundation

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