Skysong Innovations
Advancing the Arizona State University Knowledge Enterprise

1475 N. Scottsdale Road, Suite 200
Scottsdale, AZ 85287-3538
Phone: 480 884 1996 Fax: 480 884 1984

Case ID:M23-127L
Published: 9/20/2023

Inventors

Jennifer Blain Christen

Daniel Gulick

Sule Ozev

Contact

Jovan Heusser
jovan.heusser@skysonginnovations.com

System for At-Home Monitoring of Pressure and Flow Characteristics associated with Biomechanical Implants

There are numerous medical issues which are treated with simple biomechanical implants that regulate fluid pressure and flow (e.g. valves and shunts). Because there are moving parts to these implants, they are vulnerable to complications, malfunctions and biological/mechanical/parametric failures. Currently, the only way to determine if a biomechanical implant is experiencing issues is through medical imaging or clinical symptom presentation. Unfortunately, device failure may be total or intermittent and the associated symptoms may be subtle or nonspecific. The ability to observe device behavior and predict failures at-home could go a long way in reducing patient and caregiver stress as well as the need for urgent care.

Researchers at Arizona State University have developed a novel system for at-home monitoring of pressure and/or flow of biological fluids to evaluate for flow reductions or blockages. The system comprises an implanted monitoring device which responds to pressure and/or flow and wirelessly communicates with an external device to share the measured parameters. Daily testing could involve having the patient transition through several basic positions so that the sensor can take measurements and evaluate the data to determine if the device is functioning within normal parameters. It provides an early warning or prediction in the case of catastrophic events with implantable devices.

This system is a substantial improvement over the current medical standard for predicting and monitoring implantable biomechanical device failures.

Potential Applications

- Monitoring biological fluids in implantable devices with early warnings to allow for preemptive intervention or addressing of problems prior to severe symptoms in patients with:
  - Hydrocephalus

- Chronic venous insufficiency
- Bladder control insufficiency
- Heart valve insufficiency
- Additional indications requiring fluid management

Benefits and Advantages

- Extracts flow parameters of implanted devices and may predict failure or other catastrophic events
- Tested with three case studies for miniaturized valves and empirical signatures of valve degradation were observed and measured
- Does not involve complex, expensive equipment which is operated and interpreted by highly trained medical personnel
- Enables at-home testing to reduce patient and caregiver stress and expense/travel
- Implantable devices with wireless transmission
- Can be used to develop new implants or incorporated into existing implants with minor modifications

For more information about this opportunity, please see

Gulick et al – IEEE 40th VLSI Test Symposium - 2022

For more information about the inventor(s) and their research, please see

Dr. Blain Christen's departmental webpage