

Microsystems Innovation Provides New Techniques to Monitor Bone Regeneration and Repair, Helping to Reduce Wait Times for Surgery

Researchers at the University of Alberta are developing microsystems that promise to accelerate the release of patients from hospital following a hip replacement operation, helping to reduce wait times for surgery

"In our aging population, a growing number of Canadians require surgical implants to improve their quality of life. This microsensors will help to reduce the length of time patients need to remain in hospital following hip replacement surgery."

Dr. Walied Moussa
Assistant Professor of Mechanical Engineering
Adjunct Professor of Surgery
University of Alberta



Dr. Walied Moussa of the University of Alberta has developed a MEMS-based microsensors that will help patients who require hip replacement surgery.

Dr. Walied Moussa of the University of Alberta has developed a microsensors that will enable doctors to verify the success of hip replacement surgery without invasive techniques or X-rays, enabling the patient to be released from hospital sooner.

The MEMS-based innovation was developed in collaboration with Dr. John Cinats of the Faculty of Medicine and Dr. Edmond Lou, a research associate at Glenrose Rehabilitation Hospital in Edmonton. The wireless sensor is directly attached to the hip implant during the operation to begin immediately gathering data on the healing process between the implant and the bone tissue. This process is known as osseointegration.

"If osseointegration occurs directly following surgery, the patient can begin physiotherapy and be mobile within a number of weeks. If it does not occur, the surgeon needs to know quickly to consider alternative approaches," says Dr. Moussa. "It also helps doctors to minimize the risk of over-stressing the hip during recovery and rehabilitation."

A defining feature of the microsensors is that it comes with its own power source. The research team has developed an actuator that can harvest energy from the movements of the body, like many wrist watches, but on a much smaller scale.

Dr. Moussa used simulation tools provided by CMC Microsystems to test and validate the microsensors, a critical precursor to patenting the innovation. "Before fabricating the device, we had to conduct extensive simulation on the sensor and the accompanying energy source. Once we have developed a working prototype, we anticipate working with CMC on the integration and packaging of the device."

The microsensors also detects bone loss and degeneration of bone tissue, enabling the technology to be adapted in future to help treat diseases such as osteoporosis. *cmc*