Implanted wireless medical device for monitoring joint replacements

BACKGROUND
Across the world, there are several million joint replacements every year. Approximately 10% of these joint replacement operations require revision procedures.

The main cause of joint replacement failure includes mechanical imbalance leading to loosening, failure to have bone ingrowth on implant, polyethylene wear and design faults. Trauma, injury and infection can also lead to revision procedures.

New implants, increasingly utilise cementless fixation with porous ingrowth surfaces. Micromotion of the implant of less than 50μ is conducive to bone ingrowth. With increasing micromotion less optimal fibrous fixation occurs with consequent potential loosening of the implant.

Post-operative failure of joint replacement is usually detected at the end stage clinically and with X-rays showing gross loosening of the components. Earlier detection of potential loosening (due to excessive micromotion) would enable surgeons to modify rehabilitation, activity and guide decision making for earlier revision before excessive bone destruction by the loose implant.

OUR SOLUTION
We have developed a system that uses contactless, implanted sensors to transmit ongoing data on the implanted joint components back to the surgeon.

Accurate monitoring can alert the clinician of loosening which may lead to joint failure. Available data may also facilitate optimal post-surgical rehabilitation.

The wireless sensor uses an electromagnetic wave to sense the distance to within 10 microns from the sensor to the implant. This distance can be monitored daily/weekly or when required via an external powering and measurement device (EPMD). This EPMD could be an app on a smart phone or a dedicated motoring unit used by clinicians.

APPLICATIONS
- Monitoring of the health of a joint replacement
- Early detection of failure / loosening
- Facilitation of diagnosis of the painful implant
- Modification of post-operative rehabilitation to optimise bone ingrowth on implants

ADVANTAGES | BENEFITS
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Wireless sensors | Early detection of micromotion
Smartphone enabled | On demand monitoring
Accuracy: 10 microns | Early intervention
Dynamic monitoring of implant with activities of daily living | Modification of rehabilitation

INTELLECTUAL PROPERTY POSITION
Inventors: Prof Michael Heimlich, A/Prof Desmond Bokor
Australian Patent Application: Implanted sensing system for joint replacements

PARTNERING OPPORTUNITY
We are seeking an industry partner for further development and commercialisation of this technology through a research collaboration or technology license.

WOULD YOU LIKE TO KNOW MORE?
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