Docket #: S15-027B

Customized Load-Bearing and Bioactive Functionally-Graded Implant for Treatment of Osteonecrosis

Stanford inventors have developed a functionally-graded implant device for the reconstitution of the necrotic area removed after surgical treatment of osteonecrosis of the hip.

Osteonecrosis of the hip (ONH) is an increasingly prevalent and debilitating disease in which a lack of blood supply to the femoral head causes bone death, osteoarthritis, and eventual structural collapse, often progressing to require total hip replacement. While removal of the core necrotic area surgically can sometimes prevent collapse, it is only successful 20-70% of the time. Bone implants taken from the fibula to fill in the removed area can help but the harvesting process is painful. Metal implants also help prevent collapse but can result in pain for the patient and can complicate hip replacement later, should it become necessary.

Scientists at Stanford have invented a new implant that can replace the core of bone removed during surgical treatment of early stage ONH. The device is a mechanically robust functionally-graded scaffold (FGS) that acts as a filler for the tunnel of removed tissue in the femoral head. It is composed of three separate sections designed with the necessary mechanical support but also with the appropriate porosity to allow for vascularization and new bone ingrowth.

Stage of Development:

- Animal Studies (rabbits)

Applications

- Implant for replacement of the core decompression tunnel during surgical remediation of early-stage osteonecrosis of the hip to improve patient outcomes

Advantages

- Functionally-graded implant mimics properties of the surrounding tissue, allowing for new vascularization and bone ingrowth
- Unlike metal or bone implants, material is permeable to vascular invasion and bone ingrowth, lessening patient pain
- Implant can be 3D printed with novel biodegradable materials, allowing it to be personalized to each patient

Publications

- Kawai, Toshiyuki, et al. "Customized, degradable, functionally graded scaffold for potential treatment of early stage osteonecrosis of the femoral head." Journal of Orthopaedic Research 36.3 (2018): 1002-1011.

Patents

- Published Application: 20200315801
- Issued: 11,666,445 (USA)

Innovators

- Yunzhi Peter Yang
- Stuart Goodman
- Chi-Chun Pan
- Yaser Shanjani

Licensing Contact

David Mallin

Licensing Manager, Physical Sciences

Email