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Investigation of wear in orthopaedic hip prosthetic devices

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Total hip replacement (THR) is one of the most popularly performed operations in orthopaedics as evident in clinical outcomes. Potentially, an approximate of 400,000 hip joint replacement procedures are performed each year in the US. However, studies have identified that majority of hip implants are prone to wear at the taper-trunnion junction. The taper-trunnion (head-stem) is essentially the interface between the ball of the hip joint which articulates with the pelvis and the hip stem which is constrained rigidly to the femur bone. The head and stem components connect at a taper on the hip head and a trunnion on the hip stem. This junction is of peculiar and remarkable interest because it is associated with excessive fretting wear due to the taper sliding relatively against the trunnion. Excessive fretting wear at the taper-trunnion junction (trunnionosis) apparently contributes to the high failure rates of hip implants. Implant wear and corrosion lead to the release of metal particulate debris and subsequent release of metal ions at the taper-trunnion surface. This results in a type of metal poisoning referred to as metallosis. The consequences of metal poisoning include osteolysis (bone loss), osteoarthritis (pain), aseptic loosening of the prosthesis and revision surgery. Follow up after revision surgery, metal debris particles are commonly found in numerous locations. The aim is to investigate the feasibility of reducing wear in taper/head-trunnion/stem (head-stem) joints in hip implants by the use of cylindrical/parallel head-stem joints instead of the currently used tapered stems.

Biography

Obinna K Ihesiulor is presently a PhD student at the University of New South Wales, Canberra, Australia. He obtained his Master's degree in 2012 at the same University. His current research interest is in the area of prosthetic devices for joint replacements. His PhD research work is on the investigation of wear of total hip replacement at the taper-trunnion junction. In a broader sense, the principal goal is to work toward the minimization of wear debris produced in the hip joint, thereby resulting in a longer prosthetic lifetime.

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