



## *“Bearing Materials for Artificial Hips: Recent Successes and Remaining Problems”*

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### **ABSTRACT:**

The introduction of the first clinically successful artificial hips in the late 1960s has come to be recognized as one of the most effective surgical procedures ever developed. In the ensuing decades, tens of millions of patients have benefitted from this technology, with success rates of 80% or more at twenty years followup. Nevertheless, it gradually became apparent that the adverse biological reactions to the billions of sub-micron wear particles that were generated by the bearing surfaces were the primary cause of clinical failure. In the mid-1990s, three new types of wear-resistant bearings were developed to alleviate this problem: 1) radiation-crosslinked and thermally-stabilized polyethylene, 2) metal-on-metal bearings and 3) ceramic-on-ceramic bearings. In laboratory tests using hip joint simulators that “walk” the implants for millions of cycles, each of these materials exhibited markedly lower wear than the historical bearings, and this prediction was borne out in clinical studies during the past ten years. The chief disadvantage of crosslinked polyethylene is the potential for fatigue fracture, particularly if the implant is mal-positioned, causing unusually high stresses in the polyethylene. The disadvantage of metal-metal bearings is that they can undergo excessive wear if the implant is mal-positioned, and a small percentage of patients experience a severe allergic reaction to the wear particles and/or metal ions generated by the bearing. The disadvantage of ceramic-on-ceramic bearings is the potential for rare but catastrophic fatigue fracture of the components, and the potential for audible squeaking, particularly with mal-positioned components. Current research is directed at modifying the bearing materials and/or the design of the hips to address these problems and, ideally, to provide implants that will be problem-free over the lifetime of even the youngest and most active patients.

**BIOGRAPHY :** *Prof. Harry McKellop Ph.D.*, received a B.S. degree in 1970 and an M.S. degree in 1973, both in mechanical engineering, from the University of California at Los Angeles. He obtained his Ph.D. in 1988 from the University of Southern California, also in mechanical engineering, with emphasis on orthopaedic biomechanics and biomaterials. He joined the research program at Orthopaedic Hospital in 1980. Currently, he is the Director of the J. Vernon Luck, Sr., M.D. Orthopaedic Research Center and is a Professor in-Residence in the UCLA & Orthopaedic Hospital Department of Orthopaedic Surgery. Dr. McKellop's research focuses on identifying the causes of wear in artificial hips, knees and spinal disc replacements, and developing wear-resistant materials to extend the useful clinical lifespan of these implants.