

ULTAMET®

Metal-on-Metal Articulation

Hip Replacements: History Of Continual Innovation

Total hip replacement surgery has been called one of the most successful and life-enhancing surgical procedures.¹ Millions of hip replacement patients have benefited from the surgery since it was first introduced. Options for hip replacements have continually advanced and evolved over the years.

1960s-1970s

METAL-ON-METAL

Some of the first bearing surface options were metal-on-metal. Materials included stainless steel and cobalt chrome molybdenum alloys. The patient population at this point was relatively older and less active.

Success was mixed. Manufacturing processes were not precise enough to minimize wear as components rubbed together. Designs and cementing techniques were rudimentary, and components sometimes loosened and/or broke.

METAL-ON-POLYETHYLENE

After using various materials over time, orthopaedic surgeon Sir John Charnley introduced a high grade plastic, called polyethylene, for the socket side of the hip. This was paired with cobalt chrome molybdenum for the ball side of the joint.

This design was easier to manufacture and had a stem design that resulted in fewer loose and broken stems. **Polyethylene became widely used** for the socket side of the hip and was successful in many patients, although some doctors and scientists continued working with metal-on-metal and ceramic-on-ceramic designs.



METAL-ON-POLYETHYLENE

While metal-on-polyethylene hips were successful for many patients, **some complications continued or were emerging** with the metal-on-polyethylene CHARNLEY™ Hip. The smaller femoral head size sometimes caused painful dislocations. In some cases, polyethylene components fractured and wore out and small particles of polyethylene wore away from the bearing's surface, causing tissue reactions and bone loss that could lead to complex revision surgeries. In particular, polyethylene components were less successful in younger, heavier, and more active patients, who were increasingly seeking hip replacement surgery.

1980s

1990s

METAL-ON-POLYETHYLENE

Polyethylene was still widely used. But the complications with metal-on-polyethylene and concerns about performance in younger, heavier, and more active patients continued, leading the industry and surgeons to seek different options.

METAL-ON-METAL

Concerns over polyethylene's lack of durability led physicians and engineers to **reconsider metal-on-metal** implant technology. Research showed excellent long-term results in some of the first generation metal-on-metal bearing options, with virtually no wear and a low frequency of bone loss.^{2,3}

Metal-on-metal bearings also **allowed for larger femoral heads** to be used, providing greater stability for younger, heavier and more active patients. In addition, manufacturing techniques and materials had advanced, allowing designs that reduce component wear.

CERAMICS

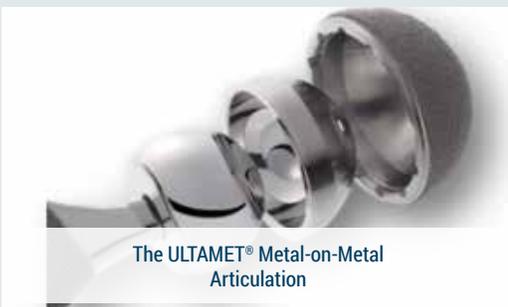
With low wear and good durability, ceramics were another alternative being considered.

Potential risks with this material included fracturing and chipping, and a squeaking noise when the patient moved.

CROSS-LINKED POLYETHYLENE

Enhanced polyethylenes, known as cross-linked polyethylenes, were also being developed. The manufacturing technique of 'cross-linking' polyethylene was done to **make the material more wear resistant**. This technology was promising, but did not yet have an established clinical track record.

2000s



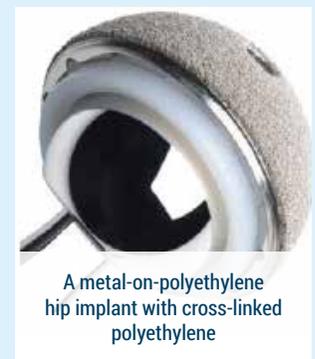
SEVERAL TOTAL HIP OPTIONS AVAILABLE

Manufacturers offered bearing options made of metal, ceramic, traditional polyethylene and cross-linked polyethylene, each with its own unique benefits and risks. Surgeons chose the bearing option based on a variety of factors, including the age, weight, and activity level of the patient.

Advancements in bearing technology have continued and physician preferences have shifted. Cross-linked polyethylene is now the most used option, and continues to perform well in patients. Ceramic-on-polyethylene and ceramic-on-ceramic are other options used frequently today.

According to the American Academy of Orthopaedic Surgeons, hip replacement surgery is one of the most successful operations in all of medicine.⁴ The orthopaedic community continues to research and innovate, always seeking to give patients and doctors better options to relieve pain and increase mobility.

2010s & Beyond



1. American Academy of Orthopaedic Surgeons. Retrieved from: <http://newsroom.aaos.org/media-resources/Press-releases/congress-urges-cms-not-to-cut-reimbursement-for-vital-orthopaedic-procedures.htm>
2. Schmalzried, Thomas P., et al. "Long-duration Metal-on-metal Total Hip Arthroplasties with Low Wear of the Articulating Surfaces." *The Journal of Arthroplasty* 11 (3), 1996: 322-31.
3. Zehri, Christopher A., et al. "Lessons Learned from Loosening of the McKee-Farrar Metal-on-Metal Total Hip Replacement." *The Journal of Arthroplasty* 14 (3), 1999: 326-32.
4. <http://orthoinfo.aaos.org/topic.cfm?topic=A00377>