

# What are the Options for Better Outcomes of Total Hip Arthroplasty?

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The main causes of failure after total hip arthroplasty are wear debris-induced osteolysis due to the macrophages engulfing the wear particles. Continuous efforts have been made to reduce the particles between the articulating surfaces. Improvements have also been made in the design, the surface finish and the surgical techniques. The problems related to fixation of components seem to have been solved. Now attention is being focused to reduce the wear particles from the bearing surfaces.

Compared with metal-on-conventional polyethylene articulation, three alternative bearing surfaces (ceramic-on-ceramic, metal-on-metal and highly cross-linked polyethylene) have recently been reported to show better radiographic and clinical outcomes after the mid to long-term follow-up. However, each bearing surface has distinct advantages and disadvantages that involve potential risks.

Ceramic bearings have superior wear resistance compared with the other bearing surfaces because of their extreme hardness, their improved lubrication due to the hydrophilic nature and the absence of releasing metal ions. However, these bearings also have disadvantages such as ceramic head fracture and chip fracture of the ceramic liner, squeaking, particularly with malpositioned components, and the difficulty of revision surgery.<sup>1,2)</sup>

Metal-on-metal bearings have reduced wear rates and improved stability and range of motion when large heads were implanted. The concerns related to these bearings include metal hypersensitivity, release of metal ions, pseudotumors and osteolysis.<sup>2,3)</sup>

Compared with metal-on-conventional polyethylene articulation, highly crosslinked polyethylene has shown a 40% to 70% reduction in the wear rate, yet the reduction in the wear rate of highly crosslinked polyethylene is not quite as dramatic as that seen with the ceramic or metal bearing surfaces. Highly crosslinked polyethylene allows for better choices for variable head sizes, the orientation and the offset. The cost of highly crosslinked polyethylene

is substantially less expensive than that for hard bearing surfaces. The first generation highly crosslinked polyethylene suffered from fatigue, reduced toughness and reduced tensile strength. Polyethylene liner fractures seem to be related to abnormally high abduction angles combined with thin polyethylene.<sup>4)</sup>

In Korea, relatively young active patients with a diagnosis of osteonecrosis of the femoral head are the main candidates (about half) for total hip arthroplasty, and the daily Korean life style requires more range of hip motion for squatting, kneeling and sitting cross-legged. These positions require the use of large heads that improve joint stability and the range of motion. Large heads are available with all three alternative bearing surfaces. Women of child bearing age and patients with renal failure and metal allergy are not indicated to metal-on-metal bearing surface regardless of their activity. Adequate positioning of components is very important for the ceramic-on-ceramic bearing surface and for the articulation with the use of highly crosslinked polyethylene.

One bearing surface cannot be applied to all patients, and the choice of surface should be customized to every patient. The age, activity level and medical status of the patients and also the skill of the surgeon should be considered when orthopedic surgeons choose appropriate bearing surfaces.

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