Patient-Specific Hip Geometry Has Greater Effect on THA Wear Than Femoral Head Size


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Abstract
In vivo linear penetration in total hip arthroplasty (THA) exhibits similar values for 28mm and 32mm femoral head diameter with considerable variations between and within the studies. It indicates factors other than femoral head diameter influence polyethylene wear. This study is intended to test the effect of patient’s individual geometry of musculoskeletal system, acetabular cup orientation, and radius of femoral head on wear. Variation in patient’s musculoskeletal geometry and acetabular cup placement is evaluated in two groups of patients implanted with 28mm and 32mm THA heads. Linear wear rate estimated by mathematical model is 0.165-0.185mm/year and 0.157-0.205mm/year for 28 and 32mm THA heads, respectively. Simulations show
little influence femoral head size has on the estimated annual wear rate. Predicted annual linear wear depends mostly on the abduction angle of the acetabular cup and individual geometry of the musculoskeletal system of the hip, with the latter having the greatest effect on variation in linear wear rate.

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