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The Importance of a Coating and Architecture of the Surface Metal on the Survival of Uncemented Total Knee Arthroplasty

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Abstract : Background: Among uncemented total knee arthroplasty (TKA), a wide variety of metal surface structures (MSS) and coatings exist to enhance implants' biological properties (i.e., bone ingrowth). This study explores the variety of MSS-coating combinations and compares their mid-long-term survivorships with cemented TKAs, by using data from the Dutch Arthroplasty Register. Methods: A total of 235,500 cemented and 11,132 uncemented primary TKAs with a median follow-up of 5.1 years were included. MSS-coating combinations were (1) Porous-uncoated (n=8986), (2) Beaded-hydroxyapatite (HA)(n=1093), (3) Matte-uncoated (n=846), (4) Matte-Titanium-nitride (TiN) (n=207). Five- and 10-year revision-free survival for all-cause revisions, and aseptic loosening of the tibial component, were calculated and compared by using Kaplan-Meier, Log-rank tests, and multivariable Cox proportional hazard regression analyses. Results: Ten-year survival rates with all-cause revisions as an endpoint, were 94.2% for cement, and 94.7%, 96.3%, 92.1%, and 79.0% for porous-uncoated, beaded-HA, matte-uncoated, and Matte-TiN, respectively ($p<0.01$). Rates for aseptic loosening were 98.8% for cemented, and 98.7%, 99.8%, 97.2%, and 94.9% for the uncemented, respectively ($p<0.01$).The beaded-HA implants were half the risk for an all-cause revision compared to cemented implants ($p<0.01$). Matte-uncoated and matte-TiN implants were at more risk of an all-cause revision than cemented implants ($p=0.01$, $p<0.01$). Proportions of revisions for aseptic loosening were comparable among most groups. Conclusion: Based on Dutch registry data, four main MSS-coating combinations among uncemented TKAs were found. survivorships for all-cause revisions and aseptic release differed widely between groups. Beaded-HA and porous-uncoated implants had the best survival rates among the uncemented TKAs and were non-inferior to the cemented TKAs.

Keywords : total knee arthroplasty, cement, uncemented, cementless;, metal surface structure, coating
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