

O 670 ALUMINA/ALUMINA ARTICULATION - WEAR TESTING AND MIXING

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Purpose of the study: Polyethylene wear has been shown to be a limiting factor for the long-term success of implants. Ceramic/ceramic articulation has been accepted as a low wear couple for this application. Several manufacturers of Alumina exist and make evaluation and appropriate testing of various combinations necessary.

Material and methods: Alumina components for hip joint prosthesis were obtained from 3 sources and subjected to a series of simulator tests up to 5 million cycles. Variations were the type of testing and the quality and type of the Alumina obtained. Tests were run in two different simulators and different protocols including micro-separation testing. Wear was characterized by weight loss, change in surface appearance and particle analysis.

Result: Standard testing yielded very low wear rates for standard Alumina combinations of second and third generation ceramics. Mixing the components from various sources did not affect the wear rate even in the long-term. Inclination of the cup did not increase the wear rate of the third generation ceramic. Micro-separation testing increased the overall wear rate almost 10 times and showed clinically relevant wear with grain pullout and grain relieve. Particle analysis compared favourably to retrieval studies.

Conclusion: An improved test method for ceramics demonstrates clinically relevant wear in respect of amount, appearance and particle size. New generation Alumina is more wear resistant and less sensitive to cup position. Mixing of Alumina components for a given design does not change the extremely low wear rates of ceramic/ceramic articulation.