

O 669 CARBON FIBRE COMPOSITES FOR ACETABULAR CUPS

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Purpose of the study: The suitability for carbon fibre composites to form acetabular bearing surfaces has been raised previously. This study addresses the potential for using a PEEK composite, and investigates biocompatibility issues together with design and wear properties.

Materials and methods: A specially formulated composite consisting of 70% PEEK and 30% milled graphitic carbon was first compounded and then injection moulded into cups representing a range of sizes. Accurate control of the internal wear surface was achieved by machining and finishing. The cups were then subjected to a range of biological tests on the solid model, simulated wear debris, and leached extracts. Wear tests, using ceramic heads, were performed to 5 and 10 million cycles using an MTS hip simulator, with the wear being assessed from the wear scar.

Results: The wear rate as measured by wear scar analysis was 0.43 (\pm 0.17) cubic mm. per million cycles, a figure close to that achieved with ceramic/ceramic bearings, and at least one order of magnitude lower than ceramic/UHMWPE. When tested according to ISO 10993, the bulk material fulfilled all requirements. The leached extracts showed very low levels ($<$ 2 ppm) of leachables, with toxicological safety levels not threatened. Simulated wear debris when tested in-vivo gave no toxic reactions in the surrounding tissue.

Conclusions: This study has demonstrated that the composite /ceramic couple when used in a hip application meet with the material requirements. It can be concluded that the composite has a strong potential for future use, and a clinical trial can be recommended.