In Vivo Evaluation of β-TCP Containing 3D Laser Sintered Poly(ether ether ketone) (PEEK) Composites in Pigs

The aim of this study was to produce an individually shaped medical implant from a 3D database and to evaluate the biological behavior of a laser sintered poly(ether ether ketone) (PEEK) implant with incorporated osteoconductive bone materials in porcine bone defects.

Laser sintered PEEK samples containing β-tricalciumphosphate (β-TCP) were implanted into critical size defects in the frontal skull of ten pigs. Compression moulded pure PEEK was used as a reference material.

The bone-implant interface was histomorphometrically analysed after 6, 12, and 24 weeks. Histomorphometrical evaluations after 24 weeks revealed that the superficially located β-TCP was in contact with the surrounding bone, whereas the other groups were fibrous encapsulated.

Interfacial shear strength was significantly higher for the β-TCP containing group in comparison to the compression moulded PEEK group (p = 0.004) and the laser sintered PEEK group.

The laser sintered PEEK implants seem to be attractive as bone substitutes for reconstructive surgery due to their individually constructed 3D shape and biocompatibility.

L. Petrolies, D. Pohle, H. Münstedt, T. Rechtenwald, K. A. Schlegel & Rupprecht