Porous fibre-reinforced composite as segmental bone replacement implant

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The aim of this study was to analyze bone ingrowth into a surface porous fibre-reinforced composite (FRC) implant. A hollow-cylindrical glass-fibre-reinforced polymethylmethacrylate (PMMA) composite implant was developed to be used as a prosthesis for the reconstruction of large and middle size bone defects in load-bearing conditions. The interconnective surface porosity (pore size maximally ~ 500 µm) of the implant was obtained by the solvent treatment method to achieve the mechanical interlocking between bone and the implant [1]. A surgical segment defect (length: 10 mm) in rabbit tibia was replaced by the surface porous FRC implant or by a control implant made of PMMA only. Fixation of the implant for healing period was made with titanium plate and screws. Bone-implant interphases were evaluated at 4, 8 and 20 weeks post-operation by microradiography, conventional histology and histomorphometric quantification. The results revealed higher bone ingrowth values for the surface porous FRC implant than for the control implants. New bone formation was also detected in the medullary canal (hollow of the implant) of the FRC implant.

Keywords: animal study, bone replacement, fibre-reinforced composite, porosity