

The Effects of Dicalcium Phosphate Dihydrate-coated Titanium Implants on Bonding to Bone in Ovariectomized Rats

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Abstract

The aim of this study was to evaluate the effects of dicalcium phosphate dihydrate (DCPD)-coated titanium implants on bonding to bone under osteoporotic conditions. We measured the bone mineral density (BMD) using peripheral quantitative computed tomography (pQCT) densitometry and evaluated the bone-implant shear force using push-out tests in ovariectomized rats. Twenty-week-old female rats underwent ovariectomy, and DCPD-coated and uncoated implants were inserted intramedullary into the right and left femurs, respectively, eight weeks after operation. Both the femora and right tibia were retrieved four weeks after implantation. In the 16 operated rats, the BMD in the right tibia was measured while the bilateral femora underwent mechanical push-out tests. The total and cancellous BMDs (\pm standard deviation) were 566.0 ± 26.3 and 114.5 ± 38.2 mg/cm³, respectively. The bone-implant shear force of the DCPD-coated implants was higher than that of the uncoated implants ($p < 0.05$). Our findings suggest that DCPD coating may improve fixation to the bone, even in the presence of osteoporosis.

Key words: Dicalcium phosphate dihydrate (DCPD), Osteoporosis, Peripheral quantitative computed tomography (pQCT), Bone-implant shear force