

Effects of a novel calcium titanate coating on the osseointegration of blasted endosseous implants in rabbit tibiae.

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Source

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Abstract

OBJECTIVE:

The purpose of this study was to investigate the effects of a nanostructured calcium coating on the surfaces of blasted Ti implants on peri-implant bone formation in the rabbit tibiae.

MATERIAL AND METHODS:

Threaded implants (3.75 mm in diameter, 6 mm in length) were roughened by hydroxyapatite (HA) blasting (control; blasted implants). The implants were then hydrothermally treated in a Ca-containing solution for 24 h to prepare Ca-incorporated Ti surfaces (experimental; blasted/Ca implants). Surface characterizations were performed by scanning electron microscopy and stylus profilometry before and after Ca coating. Forty-two implants (21 control and 21 experimental) were placed in the proximal tibiae of seven New Zealand White rabbits. Each rabbit received six implants. To evaluate the effects of the nanostructured Ca coating on the peri-implant bone-healing response, removal torque tests and histomorphometric analyses were performed 6 weeks after surgery.

RESULTS:

The Ca coating did not significantly change the surface properties produced by blasting at the micron level. Histologically, active bone apposition was observed in the blasted/Ca implants in the marrow space. Compared with the blasted implants, the blasted/Ca implants showed significantly increased bone-to-implant contact over the total implant length ($P<0.01$) and greater mean removal torque values ($P<0.05$).

DISCUSSION AND CONCLUSION:

The nanostructured, Ca-incorporated surface significantly enhanced the peri-implant bone-healing response of HA-blasted Ti implants. It may be concluded that the use of nanostructured, Ca-coated surfaces may have synergic effects in enhancing osseointegration of blasted Ti implants due to their micron-scaled surface properties and biologically active surface chemistry.