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Research paper

Mechanical testing and osteointegration of titanium implant with calcium phosphate bone cement and autograft alternatives

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ABSTRACT

The purpose of this study was to evaluate the osteointegration of a titanium (Ti) implant with the calcium phosphate cement (CPC) and autograft prostheses by pull-out test and histological examination. Stems of sixty Ti cylinders were bilaterally inserted into femoral medullary canals in 30 rabbits at the 1st, 4th, 12th, 26th and 70th postoperative weeks. The bone autograft and CPC were filled into the pre-trimmed bone marrow cavity with a polymethyl methacrylate retarder in the distal end, and then a Ti cylinder was inserted into femurs. The CPC group was significantly ($p < 0.05$) associated with a larger pull-out force at 4th (37%) and 12th (62%) weeks compared to the autograft group. The bone area and the bone-to-implant contact ratios of the CPC groups were significantly higher than that of the autograft groups at early healing stage. The histological exams suggest that the CPC enhanced the earlier bone formation around the implant at a period not longer than 12 weeks postoperation. We conclude that CPC graft has the higher ability to facilitate the osteointegration and stabilize the Ti implant at a relatively early stage than the autograft *in vivo*.

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1. Introduction

Bone or bone-like materials used in bone grafts may come from patent-self (bone autograft), from a donor (allograft) or from a man-made and synthetic source such as the

demineralized bone matrix, ceramics, polymethyl methacrylate (PMMA), calcium phosphate bone cements (CPC) and so on.

Osteointegration is an important point of assessment for the success of hard tissue replacement prostheses and

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