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Hydroxyapatite–heparin–BMP-2 on modified titanium surfaces enhances the efficacy of bone formation and osseointegration: *In vitro* & *in vivo* studyDeok-Won Lee¹ and Sung ok Hong²¹Kyung Hee University, South Korea²Catholic Kwandong University, South Korea

Introduction: In the present study, surface-modified Ti samples with hydroxyapatite (HAp) and heparin (Hep) bone morphogenetic protein-2 (BMP-2) complex (Ti/HAp/Hep/BMP-2) were prepared and the effects of the samples on the enhancement of bone formation and osseointegration in-vitro and in-vivo were investigated, as compared to Ti/HAp and Ti/Hep/BMP-2.

Methods & Materials: Surface-modified titanium (Ti) samples with hydroxyapatite (HAp) and heparin (Hep)–bone morphogenetic protein-2 (BMP-2) complex (Ti/HAp/Hep/BMP-2) were prepared, and their efficacies on the enhancements of bone formation and osseointegration in-vitro and in-vivo were examined, and then compared to Ti/HAp and Ti/Hep/BMP-2. The modified surfaces were characterized by X-ray photoelectron spectroscopy (XPS), scanning electron microscopy (SEM) and contact angle goniometry.

Results: In-vitro studies revealed that MG-63 human osteosarcoma cell lines grown on Ti/HAp/Hep/BMP-2 increased the amounts of alkaline phosphatase (ALP) activity, calcium deposition and the levels of OCN mRNA gene expression as compared to those grown on Ti/HAp, Ti/Hep/BMP-2 or pristine Ti. Moreover, Ti/HAp/Hep/BMP-2 exhibited higher bone volume (BV), bone volume/tissue volume (BV/TV), removal torque value and bone–implant contact (BIC) than Ti/HAp, Ti/Hep/BMP-2 or pristine Ti *in vivo*. Histological evaluations showed that many desirable features of bone remodeling existed at the interface between Ti/HAp/Hep/BMP-2 and the host bone.

Conclusion: Consequently, Ti/HAp/Hep/BMP-2 may have potential for clinical use as dental or orthopedic implants.

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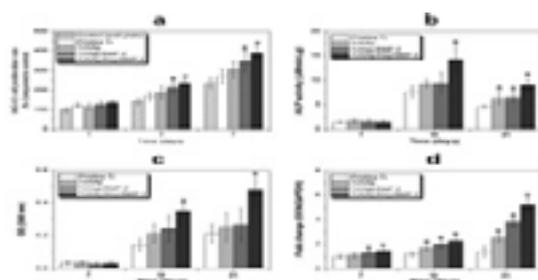


Figure 4. (a) *in vitro* cell proliferation rates of MG-63 cells cultured on pristine Ti, Ti/HAp, Ti/Hep/BMP-2 and Ti/HAp/Hep/BMP-2 samples for 1, 3 and 7 days of culture, as compared to that of MG-63 cells cultured on well-plate (control); (b) The levels of ALP activity; (c) the amounts of calcium deposition; and (d) the level of OCN mRNA expression on Ti/HAp, Ti/Hep/BMP-2 and Ti/HAp/Hep/BMP-2 samples cultured with MG-63 cells for 7, 14 and 21 days, as compared to those on pristine Ti. Error bars represent mean±SD (n=3); these experiments were repeated three times (*p<0.05)

Biography

Deok-Won Lee is an Oral and Maxillofacial Surgery Specialist and Associate Professor of Kyung Hee University College of Dentistry. His expertise is in treating and improving the oral and maxillofacial health and wellbeing of people. His research on dental implant materials creates new pathways for improving healthcare. He is continually building and investigating on adequate material for implantation through *in-vivo* and *in-vitro* models based on years of experience in research, evaluation, teaching and administration both in hospital and education institutions..

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