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Preparation and evaluation of dexamethasone (DEX)/growth and differentiation factor-5 (GDF-5) surface-modified titanium using β -cyclodextrin-conjugated heparin (CD-Hep) for enhanced osteogenic activity *in vitro* and *in vivo*

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The most ideal implant models in the dental and orthopedic fields to minimize the failure rate of implantation involve the improvement of osseointegration with host bone. Therefore, focus of this study is to prepare surface-modified titanium (Ti) samples of disc and screw types using dexamethasone (DEX) and/or growth and differentiation factor-5 (GDF-5), as well as the evaluation of their efficacies on bone formation *in vitro* and *in vivo*. X-ray photoelectron spectroscopy (XPS), scanning electron microscopy (SEM) and contact angle measurement were used to evaluate the surface chemical composition, surface morphology and wettability, respectively. The results showed that implant surfaces were successfully modified with DEX and/ or GDF-5, and had rough surfaces along with hydrophilicity. DEX, GDF-5 or DEX/GDF-5 on the surface-modified samples were rapidly released within one day and released for 28 days in a sustained manner. The proliferation and bone formation of MC3T3-E1 cells cultured on pristine and surface-modified implants *in vitro* were examined by cell counting kit-8 (CCK-8) assay, as well as the measurements of alkaline phosphatase (ALP) activity and calcium deposition, respectively. MC3T3-E1 cells cultured on DEX/GDF-5–Ti showed noticeable ALP activity and calcium deposition *in vitro*. Active bone formation and strong osseointegration occurred at the interface between DEX/GDF-5–Ti and host bone, as evaluated by micro computed-tomography (micro CT) analysis. Surface modification using DEX/GDF-5 could be a good method for advanced implants for orthopaedic and dental applications.

Biography

Lee Deok-Won is currently working as a Professor at Department of Oral & Maxillofacial Surgery Kyung Hee University Dental Hospital at Gangdong (Kyung Hee Neo Medical Center) School of Dentistry, Kyung Hee University.

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