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Determination of osteoblastic differentiation and osteogenic transcription factor expression on fibronectin or bone sialoprotein II-immobilized microgrooved titanium substrata

Suk Won Lee
Kyung Hee University, South Korea

Here, we aimed to determine the effect of fibronectin (FN) or bone sialoprotein ′ (BSP2)-conjugated microgrooved titanium (Ti) substrata on osteoblastic differentiation and time-dependent osteogenic transcription factor expression in human bone marrow mesenchymal stem cells (MSCs). 60 μm wide and 10 μm deep microgrooves were fabricated using photolithography and subsequent acid etching to generate a microgrooved Ti surface with acid-etched roughness (E60/10). Both smooth and acid-etched Ti were used as controls (NE0 and E0). Human serum FN and human BSP2 were immobilized on the fabricated Ti surfaces by silanization using 3-aminopropyltriethoxysilane (NE0FN, E0FN, E60/10FN, NE0BSP2, E0BSP2, and E60/10BSP2). Alkaline phosphatase (ALP) activity and osteoblastic differentiation of MSCs were determined using ALP activity assay and extracellular calcium deposition assay, respectively. Time-dependent expression of various osteogenic transcription factors including ATF4, FRA1, RUNX2 and Osterix were analyzed. As a result, both FN- and BSP2-immobilized microgrooved Ti significantly enhanced the osteoblastic differentiation and the time-dependent expression of various osteogenic transcription factors. Specifically, the two-way ANOVA result of ATF4, FRA1, RUNX2, and Osterix expression presents a synergistic promotion effect of microgrooves and matrix protein immobiliztion on the osteoblastic differentiation of MSCs. Taken together, FN- and BSP2-immobilized microgrooved Ti can act as an effective biomaterial surface for promoting osteogenicity.

Biography

Suk Won Lee has completed his PhD and Post-doctoral fellowship from Yonsei University College of Dentistry. He is currently an Associate Professor of Kyung Hee University College of Dentistry. He has published more than 25 papers in reputed journals in the fields of Biomaterials, Biomedical Engineering and Oral Implantology. He has been serving as Director, Education Delegate and Editorial Board Member of repute.

ysprosth@hanmail.net

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