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Abstract

TITLE: Biological Cell Activity and Gene Expression on Implants with Different Macro and Microstructured Surfaces and Chemical Composition

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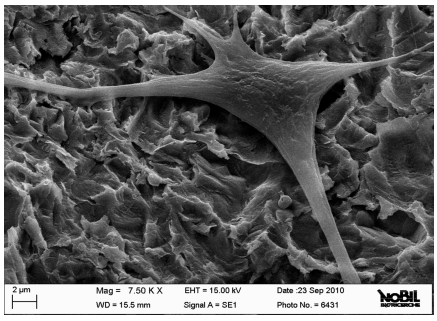
ABSTRACT BODY: Introduction: The interaction between cells and implant is determined by surface macro/microstructure and by its chemical composition but it is not yet clear which biological cell activity is influenced by these parameters. The aim of this study was an in vitro comparison of osteoblast cell adhesion, proliferation, differentiation, and gene expression related to two different surface treatments applied to two implant designs to determine whether and how the interaction between cells and implant is influenced by macro/ micro structure (micro design and roughness) and the surface chemical composition of the implant. Methods: Fifty-two implants were used=26 EZ-Plus Internal (Megagen Implant Co, Ltd, Korea) 5mm x 13mm (n=13 with HA grit sandblasted RBM surface; n=13 with a Ca2+ incorporated in titanium XPEED surface) and n=26 Anyridge (Megagen Implant Co, Ltd, Korea) with same dimensions and surface treatments of the previous implants. The implant roughness and macro and microstructures were analyzed by Stereo-SEM and SEM, and the surface chemical composition by XPS analysis. SaOS-2 osteoblasts were used for both the biological tests and the RT-PCR. Twelve titanium disks with RBM and XPEED surface treatment were used for the immunofluorescency analysis. Results: In both the EZ-Plus and Anyridge implants the XPEED surface showed less contaminants such as Si, Cl, Al, and C than the RBM surface. Both surfaces showed similar mean roughness (Ra= 0.84 vs. 0.82µ) but the depth (Rz=5.12µ vs. 3.56µ) and density (RSm=10.62µ vs. 16.19µ) of the porosity were significantly increased on the XPEED surface (p<.01). The XPEED surface presented more and faster osteoblast spreading, adhesion and proliferation than the RBM surface in both implant designs. Data obtained from immunofluorescency were similar. The XPEED surface induced better expression of bone formation genes. No statistically significant differences in ALP activity between surfaces were found. Conclusions: The XPEED surface showed less contaminants. A low percentage of Carbonium did not decrease the surface wettability and well promoted a cell to implant contact. The macro-micro pore structured design and the chemical composition of the XPEED surface allowed a better and faster cell adhesion and proliferation but did not play an obvious role in in vitro cellular differentiation.

(No Table Selected)



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