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Adhesion and growth of osteoblast-like cells on laser-engineered porous titanium surface. Expression and localization of N-cadherin and β-catenin

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Introduction. Response of different types of cells on biomaterials is crucial for the applications of tissue engineering and regenerative medicine. It is recognized that cell behaviours depend largely by material surface characteristics.

Objectives. The purpose of this study was to define the biologic response of MG63 cells to an innovative patented surface SYNTHEGRA®.

Material and Methods. The MG63 morphology and distribution on the three different titanium disks surface were evaluated by microscopy analysis after staining with hematoxylin and eosin. Cell adhesion was determined by crystal violet assay at 48 hours while proliferation and cytotoxicity were performed by MTT assay at 24, 48, 72 and 240 hours. The expression and localization of N-cadherin and β-catenin were studied by immunofluorescence and confocal microscopy.

Results. At 48 h the adhesion was similar in all titanium surfaces, no cytotoxic difference in cell viability were observed in all titanium disks when compared with controls, while the cell growth on p30 disks was significantly higher at 240 h than at 72 and 24 h. Morphological analysis show that cells are aligned along the grooves and inside the cavities. β-catenin appeared more diffuse and localized underneath the cell membrane, while N-cadherin signal was fainter in cells grown onto SYNTHEGRA® surface.

Conclusion. This work put in evidence the performance of newly designed laser-micromachined surface for adhesion, growth and distribution of human osteoblast-like cells. SYNTHEGRA® surface inducing modification of N-cadherin and b-catenin expression and localization, which are suggestive of cells undergoing differentiation towards osteocytes, could be particularly suited for immediate load implant procedures.

Keywords: Osteoblast, biomaterials, adhesion molecules, osteointegration.