

Effects of surface topography on growth and osteogenic differentiation of human mesenchymal stem cells

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The clinical success of an endosseous artificial implant is related to the quality of its osseointegration with the surrounding living bone. To achieve a stable anchorage, mesenchymal cells, migrating to the implant surface from the surrounding tissue, must differentiate towards mature osteoblasts rather than connective tissue cell types. It is well known that the cell response is affected by the physicochemical parameters of the biomaterial surface, such as surface energy, surface charges or chemical composition. Topography seems to be one of the most crucial physical cues for cells (1). In particular, interactions between mesenchymal stem cells (MSCs) and surfaces with specific micro and nano patterns can stimulate MSCs to produce bone mineral *in vitro* (2). Herein, stamps reporting different micro and nano features were fabricated in order to obtain several corresponding replicas in a short time through microinjection molding. Then, the effects of the substrate topography on human bone marrow-derived MSC adhesion, proliferation, and osteogenic differentiation were investigated in the absence of inductive growth factors. Collectively, our data show that both micro- and nano-structured surfaces possess osteoinductive properties. A relationship between dimensional feature of surface topography and differentiative potential was noted. On the contrary, cell adhesion and proliferation seemed to be unaffected. Further *in vivo* studies will be carried out to confirm the osteoinductive properties of selected surface geometries.

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References

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Keywords

Osseointegration; Surface topography; Mesenchymal stem cells.