Abstracts *(Oral Presentation)*

The Culture of Human Mesenchymal Stem Cells on Biomimetic 3D-printed Hydroxyapatite Scaffolds for Bone Tissue Repair

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Abstract

Introduction: Mesenchymal stem cells (MSCs) are multipotent stem cells that have the ability to differentiate into various cell, types including osteoblasts. They are the potential cell source for bone repair. MSCs reside in specialized microenvironments that sustain and regulate their fate. As the conventional 2D-culture system lacks the key elements for supporting bone regeneration, the construction of the microenvironment for cell culture consists of the 3D-hydroxyapatite (HA) scaffold, and biomimetic calcium phosphate coated 3D-printed HA is important.

Objectives: To characterize the proliferation, adhesion, and osteogenic differentiation of MSCs grown with the different 3D-hydroxyapatite scaffolds.

Methods: MSCs isolated from the bone marrow (BM-MSCs) and umbilical cord (UC-MSCs) were cultured on the 3D-HA and coated 3D-HA in the osteoinductive medium. The scanning electron microscopy and immunofluorescence staining were used to examine the characteristics and the attachment of MSCs to the scaffolds. The proliferation was measured using AlamarBlue™ Cell Viability Reagent. The osteogenic differentiation was determined by alkaline phosphatase (ALP) activity and the osteogenic gene expressions.

Results: The BM-MSCs and UC-MSCs cultured on the 3D-HA and coated 3D-HA presented similar proliferation to the 2D culture. The MSCs attached to the 3D-HA and coated 3D-HA. After induction with osteogenic stimuli, ALP activity and osteogenic gene expression were increased compared to the MSCs cultured with a growth medium. Interestingly, MSCs grown on coated 3D-HA exhibited a higher ALP activity and osteogenic gene expression than those cultured on the 3D-HA.

Conclusions: 3D-HA serves as compatible material for MSC culture. Moreover, biomimetic coating improves biocompatibility and osteoinductivity.

Keywords: Mesenchymal stem cell, Hydroxyapatite, Scaffold, Bone
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