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Biomimetic design of 3-D geometry of scaffolds for bone tissue engineering

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Biomimetic design and 3-D printing of scaffold with heterogeneous internal geometry is essential for cell distribution, blood vessel in growth and biomaterial degradation in bone tissue engineering. This study was designed to demonstrate the heterogeneous pores and channels in 3-D printed scaffolds for bone tissue engineering. Scaffolds were prepared using ceramic particles through 3-D printing. Pores and connecting channels with diameters of 200mm-500mm were designed for facilitating cell seeding and cell distribution. Internal pores of 50mm-200mm were designed for bone regeneration. Nano-sized surface topography was designed for enhanced degradation of scaffold. The fabricated scaffolds were evaluated using scanning electronic microscopy. SEM of fabricated scaffolds revealed that 400mm- 500mm inter-connecting channels crossed over the entire scaffold, that ~200 mm internal pores were scattered over the scaffold and connected to each other and to the inter-connecting channels, and that ~200 nm pores showed on the surfaces of inter-connecting channels and internal pores, which would play an important role in increasing the surface ratio of materials and facilitating material degradation. A heterogeneous profile of connecting channels and internal pores was evident in these 3-D printed biomimetic scaffolds. As a conclusion, the biomimetic design and fabrication of scaffolds for bone tissue engineering can be fulfilled by a 3-D printing process. Heterogeneous profiles of inter-connecting channels, internal pores, and nano-sized surface topography can be generated to provide a biomimetic environment suitable for bone tissue engineering.

Biography

Minhao Li is a senior student from the Kunshan High School, Jiangsu, China. He has been working on a project of bone tissue engineering during his research internship under the supervision by Dr. Lee Chou, Professor of Biomaterials of Boston University.

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