iMedPub Journals
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General Surgery Reports

2021
Vol.5 No: S2

Multifunctional coating combined with 3D-printed bio-inspired scaffold induced bone regeneration

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Abstract

The treatment of bone defect has always been difficult in clinical practice, usually aassociated with infection and angiogenesis disorders, which further affect bone healing. Therefore, it is important to develop a suitable sized scaffold that can accelerate both osteogenesis and angiogenesis for the treatment of bone defects. Herein, we synthesized a multifunctional coating (QCS- GO-PDA) composed of quaternized chitosan (QCS), graphene oxide (GO) and polydopamine (PDA), and used selective laser sintering (SLS) in 3D printing to form a composite of polylactic acid/hydroxyapatite (PLA/HA), and then applied the multifunctional coating to the PLA/HA scaffold. Compared with the single component, the antimicrobial osteogenic effect was enhanced after covalently grafted with the QCS and GO, and the PDA provided adhesion and contributed to the surface functionalized modification of the 3D printed scaffold. The results show that the combination of the multifunctional coating and the 3D printed personalized scaffold ($PLA/HA^{QCS-GO-PDA}$) can significantly promote the regeneration and repair of bone tissue. In vivo and in vitro experiments showed that the $PLA/HA^{QCS-GO-PDA}$ group increased the osteogenic ability of the bone defect during healing, effectively inhibited the production of inflammatory factors in the later period, and induced bone regeneration, which is considered as a novel type of bone regeneration scaffolds with potential for clinical application.

Biography:

Hang Xue has completed his PhD at the age of 29 years from Tongji Medical College, Huazhong University of Science and Technology, China. He is the Doctor of Trauma Orthopedics, Union Hospital, a first-class medical center. He has published more than 10 papers in reputed journals and has been serving as an editorial board member of several journals.