View metadata, citation and similar papers at core.ac.uk
brought to you by CORE

東北大学機関リポジトリ
TOUR
Tohoku University Repository

The effect of Fray-Farthing-Chen Cambridge process on osteogenesis of human bone marrow mesenchymal stem cells on ceria-stabilized zirconia/alumina nanocomposite surface in vitro

著者	WU YUHAN
学位授与機関	Tohoku University
学位授与番号	11301甲第18305号
URL	http://hdl.handle.net/10097/00126185

論 文 内 容 要 旨

学籍番号 B4DD5035　　　　氏 名 呉 雨函

Purpose: Investigate the effects of Fray-Farthing-Chen (FFC) Cambridge process on the proliferation and osteogenesis of human bone marrow mesenchymal stem cells (hBM-MSCs) on ceria-stabilized zirconia/alumina nanocomposite (NANOZR; Panasonic Health Care, Japan) surface *in vitro*.

Materials and methods: NANOZR discs (diameter, 15 mm; thickness, 1.5 mm) exposed to three kinds of surface conditions i.e. machined (MA), sandblast and acid-etched (SLA), and the FFC Cambridge process were used in this study. SLA-CpTi (pure titanium; Nippon Steel Co, Japan) was used as a control. In the osteogenesis-related experiments, hBM-MSCs were cultured in osteogenic differentiation medium simulating an environment filled with various osteogenesis inducers. The proliferation and osteogenesis abilities of hBM-MSCs were investigated by 5-ethynyl-20-deoxyuridine (EdU) flow cytometry assay, alkaline phosphatase (ALP) activity assay, alizarin red S staining, and real-time quantitative polymerase chain reaction (qPCR) analysis.

Results: The proliferation of hBM-MSCs was significantly enhanced on FFC-NANOZR when compared to the controls. Similarly, FFC-NANOZR significantly enhanced the osteogenic differentiation of hBM-MSCs when compared with the machined NANOZR and SLA-NANOZR groups during the early stage of osteogenesis; the effect was equivalent to that of SLA-Ti. Relative levels of osteogenesis related mRNA including *Runx2*, *Sp7*, *Bmp-2*, *Col1a1*, *Ocn*, and *Opn* were examined by qPCR. The findings were consistent with those of the ALP activity and alizarin red staining assays.

Conclusion: Within the limitation of this study, our results suggested that the FFC Cambridge process significantly enhanced the proliferation and osteogenesis abilities of hBM-MSCs on NANOZR surface in vitro indicating its potential as a promising surface modification method for the development of next-generation all-ceramic implant materials.