B-4. The Biologic effects of Fibronectin typeIII 7-10 to MC3T3-E1 Osteoblaston the Surface Modified Titanium

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Over the past 50 years, studies in the dental and orthopedic fields have examined the biocompatibility of titanium(Ti) to achieve osseointegration. Numerous studies have been tried to modify Ti surface mechanically to improve the quality of osseointegration. Recently other approaches involve treating Ti with biologically active substances such as adhesion proteins and growth factor. Fibronectin is an important matrix glycoprotein that mediates cellular activity and improves wound healing. The object of this study is to investigate on the biological effects of fibronectin typeIII 7-10 on MC3T3-E1 osteoblast on the surface modified Ti.

Plasma fibronectin(FN) and fibronectin typeIII repeat 7-10(FNIII 7-10) were coated to commercially pure titanium(cpTi) by gold thiol chemistry. Two types of cpTi disks, one sand blasted and acid etched(SLA) treated and one with smooth surface, were used as control. Cell proliferation, alkaline phosphatase(ALPase) activity and cell morphology on the disks were examined using MC3T3-E1 osteoblast cells. We also performed time-course study for examining the distribution of focal adhesion kinase(FAK) and actin on the cells in each material.

Present study showed that the number of cells and ALPase activity on FNIII 7-10 coated Ti disks were greater than that of on the other materials.

Distinct surface modification-dependent differences were observed in osteoblast adhesion and spreading. On FN and FNIII 7-10 coated titanium, cells were well attached and spread, while on SLA and smooth surface disks, cells were spike like and rhomboidal pattern respectively. On FN and FNIII 7-10 coated surface, the numbers of FAK-positive focal adhesions increased continuously. Furthermore, actin staining showed that the cells on FN and FNIII 7-10 coated disks displayed well-defined polarized stress fibers, whereas the cells on the SLA and smooth surface possessed moderate-defined stress fibers with weak polarity.

Taken together, these results suggest that the Ti surface modified with FN and FNIII 7-10 by using gold thiol chemistry increased osteoblast proliferation, ALPase activity, spreading and differentiation.