PR-II-2. Characterization of titanium surface with modified surface chemistry for biomedical application

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Background

Recently reported studies have demonstrated the potential advantages of the addition of surface phosphate chemistry to implant surface, which showed considerable apatite formation on its surface in vitro. It has been suggested that the in vitro apatite-forming ability of titanium surface in simulated body fluid is consistent with the in vivo bone bonding behaviour of the implants. In this study, we investigated the surface characteristics of phosphate ion-incorporated titanium (P-Ti) surface with intermediate surface microroughness for future biomedical use.

Materials and Methods

P-Ti surface was prepared by chemical treatment. Surface characteristics of P-Ti were evaluated by scanning electron microscope, thin-film X-ray diffractometry (XRD), electron probe microanalysis (EPMA), and stylus profilometry. In vitro apatite forming ability of P-Ti surface was investigated after immersion in Hank's balanced salt solution. The morphology of spreaded cells on different titanium surfaces were evaluated for a 20 min attachment period using MC3T3-E1 pre-osteoblasts by means of scanning electron microscopy. Machined and blasted/etched surfaces were used as control.

Results

P-Ti showed surface microstructure with average surface roughness (Ra) of 1.2 um, which may be favorable roughness value for osseointegration. The results of XRD and EPMA showed the formation of crystalline, phosphate-ion incorporated ti-

tanium oxide layer on experimental surface. Considerable apatite deposition was observed on the surfaces of P-Ti samples after soaking in HBSS, indicating its in vitro bioactivity. P-Ti surface showed enhanced cell spreading in comparison with the other surfaces.

Conclusion

These results indicate the potential effectiveness of phosphate ion-incorporated titanium surface for providing titanium implants bioactivity and promoting osteoblast attachment and further bone healing.