OMICS Group Conferences
Accelerating Scientific Discovery
2nd International Conference on
Tissue Science & Regenerative Medicine
August 26-28, 2013 Raleigh-NC, USA

Is it possible to increase the osteoblastic activity by using PLGA composites that are produced by calcium phosphate dibasic?

Nevzat Selim Gokay

Namik Kemal University, Turkey

Abstract

Biodegradable implants may be an option in the treatment of fractures. It was hypothesized that the optimal degradable implant should help the bone healing process. In this study, the effects of poly lactide-co-glycolide acid (PLGA;85:15) based implant system whose biodegradation time was elongated by using calcium phosphate dibasic, on osteoblastic activity was evaluated. The preferred biodegradable PLGA composite was scanned under electron microscopy for surface characterizations and porosity. A prototype of plate and screws were molded from this PLGA composites containing calcium phosphate dibasic. The osseous cells (n=6) were cultured according to the standard primary human cell culture protocol. The osteoblastic activity of the cells were determined with flow cytometer by immune phenotyping. After a period of 6 weeks with multiple cells passaging, cells were collected and seeded on the previously formed PLGA containing well plates. For 21 days, the osteoblasts of each patient were followed under inverted microscope. The viability of these cells were evaluated by MTS-Enzyme Linked Immunosorbent Assay. Histopathological evaluation was also performed. Another commonly used PLGA based plate system, without additives were taken as control group. MTS cell proliferation results were analyzed statistically using analysis of variance (ANOVA) and F test. The novel designed polymeric biodegradable plate-screw implant system was not toxic to the primary osteoblast cultures. Cells were nested perfectly into this implant system and this was proved by determination of cell proliferation and differentiation using fluorescein-iso-thio-cynate (FITC) – phyco-erythrin (PE), conjugated monoclonal antibodies [negative expression; HLA-DR (% 7,54±0,0263), CD10 (% 4,67±0,0155), CD14 (%7,73±0,0232), CD34 (%8,41±0,0266), CD11b (%8,67±0,0235), CD117 (%5,48±0,0248) and, CD45 (%20,47±0,04818)/ positive expression; CD44 (%94,58±0,0270)] and isotype controls. The bio-degradation period was approximately 8.5 months. According SEM analysis, the high porosity of the inner areas of the designed plates were remarkable. After drying, cracking occurred on the surface of the plague and osteoblasts showed a homogenous distribution on the plate system. Better cell nesting forms were observed. We suggest that the novel designed biocompatible polymeric plate-screw implant system can safely be used in fracture fixation.

Biography

Nevzat Selim Gokay has completed his M.D. degree at the age of 24 years from Istanbul University Cerrahpasa School of Medicine. He has gained the title of Consultant Orthopaedic Surgeon at 2005 from Istanbul University Cerrahpasa School of Medicine. He has been working as an Assistant Professor in Namik Kemal University Department of Orthopaedics and Traumatology since 2008.