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Synergistic effect of TGF-B1 and BMP–7 on chondrogenesis and extracellular matrix synthesis

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Abstract

Cartilage tissue has alimited capacity of regeneration. Successful results has been achieved in clinics by seeding in vitro grown chondral cells to the defect area. However, histologically, the developed neocartilage has been found in fibrous nature not hyaline. The problem here is the fibrous cartilage can't fulfill the mechanical properties of original hyaline carrilage. It has been showed that several growth factors can promote chondrocyte proliferation and extracellular matrix synthesis in vitro and in vivo. In this study, we went further and investigated the importance of the signal timing of BMP–7 and TGF-β1 on chondrocyte proliferation and matrix synthesis, in-vitro. We designed a novel chitosan based hydrogel system which has a capability of controlled and consecutively release of BMP-7 and TGF-β1, for 9 and 21 days respectively. Hydrogel structure was analyzed with scanning electron microscope. The release kinetics of Growth Factors (GFs) was determined with ELISA. Standard human chondrocyte cultures were prepared and seeded on different wells according to their groups. Chondrocyte viability and toxicity after being tested with MTS and collagen type II synthesis, were quantified with western blotting. Canonical regression analysis was used for measuring statistical evaluation. Chitosan based hydrogel allowed controlled release of GFs in different time intervals for BMP–7 and TGF-β1. Double peak concentration gradient was found to be present in the group loaded with both GFs. In this group, substantially higher chondrocyte growth and collagen synthesis were also detected. Consecutively and controlled release of growth factors may increase the cell number and enhance collagen type II synthesis.

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.