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Titel des Beitrags:
Osteogenic differentiation of mesenchymal stem cells in fibrin-hydroxyapatite matrix in a 3-dimensional mesh scaffold.

Abstract:
To explore the feasibility of culturing mesenchymal stem cells in an hydroxyapatite-fibrin matrix held by a mesh scaffold and inducing osteogenic differentiation of these cells. The aim was to obtain bone-material in vitro in a desired form. Rat mesenchymal stem cells were mixed with fibrin and nanocrystalline hydroxyapatite in tubular scaffolds constructed from a poly(L-lactic acid) mesh, and cultured under standard and osteogenic differentiating conditions. Cell viability, cytotoxicity and alkaline phosphatase activity were followed for 3 weeks. Living cells and the expression of bone markers were visualized by fluorescence staining and immunofluorescence staining, respectively. Attachment of cells to the scaffold mesh surface was examined by scanning electron microscopy. Cell viability decreased and cytotoxicity increased rapidly during the first day of culture but stabilized gradually afterwards, indicating fast adaptation of the cells in the matrix-scaffold environment. From day 17, cytotoxicity started to decrease, paralleled by an increase in alkaline phosphatase activity, indicating osteogenic differentiation. A large number of living cells were visible in the matrix and on the mesh scaffold. Expression of
collagen type I, osteoponin, osteocalcin and core binding factor 1 were evident under osteogenic differentiation conditions. The three-dimensional construction of a fibrin-hydroxyapatite matrix in a biocompatible poly(L-lactic acid) as mesh-scaffold provides a promising carrier for producing bone-material in vitro in a desired form for applications in regenerative medicine.