

Histologic structure of engineered cartilage in designed scaffold from synovial membrane

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Abstract

Objective: Tissue engineering is a new approach to repair cartilage lesions. Autologous Chondrocyte Transplantation (ACT) is one of the tissue engineering methods with some limitations due to expanding of chondrocytes in monolayer culture. Culturing of chondrocytes in scaffold preserves chondrocyte morphology. Extracellular matrix of natural tissues are more applicable to synthetic type of scaffolds in clinic. Therefore, in this study, the synovial membrane and amniotic membranes are used as a natural scaffold. In the case of formation cartilage tissue, natural scaffold may be free of problems to other synthetic available scaffolds for clinical applications.

Materials & methods: chondrocytes after enzymatic removal, were cultured for proliferation. For tissue formation, chondrocytes were cultured between layers of synovial membrane and amniotic membranes for 21 days and examined histologically with H&E, toluidine blue and immunohistochemical staining. The construed tissues in experimental groups were compared with tissues composed of merely chondrocytes and membranes as a control group.

Results: our histologic evaluation of constructs showed that tissue formation has been occurred. Proteoglycan production was observed in cell micromass cultures and cell-scaffold constructs. Immunostaining method revealed the ECM of cell micromass cultures contains higher collagen type I than higher collagen type II. In cell-scaffold constructs the expression of collagen type I extensively decreased and in this cultures collagen collagen type II expressed more than cell micromass cultures.

Conclusions: The current study indicate that application of natural scaffold improves chondrocyte phenotype by maintaining collagen type II expression and inhibiting collagen type I production.

Keywords: Scaffold, synovial membrane, amniotic membrane, Cartilage, tissue engineering