

THE STUDY OF THE THERAPEUTIC EFFECTS OF HYALURONIC ACID, CHONDROINDUCTIVE FACTORS AND MESENCHYMAL STEM CELLS ON REGENERATION OF ARTICULAR CARTILAGE DEFECTS IN RABBITS

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Introduction: Regeneration of injured articular cartilage is one of the most difficult problems in traumatology and orthopedics. Applied nowadays surgical methods that are aimed at stimulation of cartilage regeneration in damaged joint can not provide the complete treatment of complications. Thus, it is necessary to search for alternative therapy, such as autologous chondrocyte transplantation for articular cartilage regeneration, which has been successfully used abroad.

The purpose of present study was to investigate the effect of synovium derived mesenchymal stem cells (MSCs), chondroinductive growth factors and hyaluronic acid on regeneration of articular cartilage defect in rabbits.

Methods: MSCs were isolated from synovial membrane of Flemish giant rabbits and then cultured in complete DMEM medium containing 10% fetal calf serum, 100 IU/ml penicillin and 100 µg/ml streptomycin. Synovium-derived MSCs were characterized by CFU-assay and by their ability to differentiate in three lineages: osteoblasts, chondrocytes and adipocytes. The influence of TGF-β1 and BMP-4 on chondrogenesis were examined by creating micropellets and then formation of hyaline-like cartilage was analyzed by histological analysis. 4 mm in diameter cartilage defect was performed by using a kit for mosaic chondroplasty. Delivery of MSCs and growth factors was performed. The control and experimental groups were analyzed histologically and microscopically at 30, 60 and 90 days after the injection.

Results: The study on the effect of MSCs and hyaluronic acid on the cartilage defects regeneration in rabbits showed that synovium-derived MSCs after intra-articular injections are localized mainly in the defect area. It has been found that single intra-articular injection of MSCs and hyaluronic acid resulted in a complete repair of articular cartilage defect only in 90 days. However, combined administration of synovium-derived MSCs, hyaluronic acid, TGF-β1 and BMP-4 vastly increased the process of regeneration, that resulted in a complete repair of hyaline-like cartilage in 30 days.

Conclusion: Thus, in our study it was shown that combined application of synovium-derived MSCs, growth factors (TGF-β1, BMP-4) and hyaluronic acid can significantly promote regeneration of articular cartilage defects in rabbits.