Bone marrow Mesenchymal Stem Cells in a Hyaluronan Scaffold for treatment of an osteochondral defect in a rabbit model

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Introduction: Mesenchymal stem cells (MSC) may result in better quality of cartilage repair, reduction of donor site morbidity from cartilage harvesting and less hypertrophy of the repair tissue compared to autologous chondrocyte implantation. The purpose of this study was to evaluate whether MSC in a hyaluronan scaffold (HYAFF 11®) would induce repair of an osteochondral defect in a rabbit knee, and to compare the degree of repair with that obtained with same scaffold without cells.

Materials and Methods: Bone marrow was harvested from the posterior iliac crest in 11 New Zealand White rabbits. MSC were isolated and cultured in autologous serum for 28 days. The cells were transferred to a hyaluronan scaffold 48 hours prior to implantation. A 4 mm diameter wide and 1.5 mm deep defect was created in the medial femoral condyle of both knees and a scaffold seeded with approximately 2 x 10^6 MSCs was implanted in one knee while an empty scaffold was implanted in the contra-lateral knee. After 24 weeks the rabbits were euthanized and histological sections were subjected to semiquantitative and quantitative evaluation by observers blinded regarding treatment modality.

Results: High degree of filling of the defects was obtained, with no statistically significant difference between the two treatment modalities (table 1). There were more chondrocyte cluster formation (p=0.03) in the MSC treated defects, but no difference in the parameters hyaline like cartilage, integration to surrounding cartilage, amount of necrosis and surface integrity. No hypertrophy of the repair tissue was seen.

Discussion: In this study it appears that the additive effect of MSC in the repair of an osteochondral defect is limited. The study seems to support previous findings with relatively small differences when comparing hyaluronan scaffold with and without MSC in osteochondral defects. In an osteochondral lesion cells from the bone marrow adjacent to the lesion may contribute to the repair and partly outweigh the effect of the added cells. The effect of adding MSC or chondrocytes may be more important when the access to cells from the bone marrow is limited. However, MSC in a hyaluronan scaffold is a promising treatment approach, but further studies are needed.

References:

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