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Amniotic membrane for cartilage regeneration in a one step-method

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Cartilage tissue has limited healing capacity. Osteoarthritis (OA) – the most common cause of cartilage lesions – has an incidence of approximately 10% in men and 13% in women aged over 60. This is likely to increase due to aging and obesity. Current treatments include matrix-associated autologous chondrocyte transplantation (MACT) as well as in situ-induction of cartilage repair by microfracture. Therapy of cartilage defects with these methods is unsatisfying. MACT is costly and comprises the disadvantages of two separate operations. Microfracture is limited to smaller defects and known to produce fibrous cartilage. Therefore, a clear need exists for new approaches to stimulate cartilage regeneration.

In our study, we investigated the usability of amniotic membrane (AM) as transplant fixation of cartilage defects (1.5 X 2.0 cm) in equine knees. Five groups (N = 6) were included, each with AM cover plus: I. Microfracture, II. Microfracture/cartilage fragments/fibrin, III. Adipose-MSCs/cartilage fragments/fibrin, IV. Bone marrow-MSCs/cartilage fragments/fibrin, and V. no filling. 6 weeks post-surgery arthroscopy was performed. 12 months post-surgery tissue was harvested including native cartilage for comparison. Analyses comprised macroscopic imaging, biomechanics, gene expression and histology.

Arthroscopy showed smooth integration of the AM into the defect bed. No adverse reaction was observed during the entire study. Macroscopic analysis showed all treated defects were significantly more covered with newly formed cartilage in contrast to no filling, with best results for two defects of the bone marrow-MSCs group. With adipose-MSCs the stiffness was comparable to native cartilage and Aggrecan, SOX9 as well as Versican expression was higher.

Biography

Julia Lerchbacher-Hieslmayr (nee Lerchbacher) has completed her masters degree in zoology (Mag. rer. nat.) at the age of 19 in 2011 from Karl-Franzens University Graz. For 3 ½ years she worked at the Research Centre of Medical Technology and Biotechnology - fzmb GmbH in Bad Langensalza (Thuringia). Currently she is doing her Ph.D. studies at the Technical University of Munich (Klinikum rechts der Isar). At present, her main interests in the field of regenerative medicine are cartilage regeneration and usability of amniotic membrane.

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