Osteoarthritis and Cartilage Vol. 15, Supplement B Posters B123

P140

Intraoperative acoustic evaluation of living cartilage of the elbow and knee during mosaicplasty for osteochondritis dissecans of the elbow

K. Nishitani1, Y. Nakagawa1, T. Gotoh1, K. Mori1, M. Kobayashi1, H. Kuroki2, K. Yasura2, Y. Okamoto3, T. Nakamura4;

Results: and signal interval (index of cartilage thickness). cartilage stiffness), signal duration (index of cartilage roughness), three parameters of acoustic properties: signal intensity (index of an acoustic probe and our wavelet transform method, we measured validity of the mosaicplasty for elbow OCD.

Purpose: Autologous osteochondral mosaicplasty for osteochondritis dissecans of the capitellum (OCD) is being used increasingly in adult patients. The purpose of this study is to evaluate the living articular cartilage of the elbow and knee and to examine the validity of the mosaicplasty for elbow OCD.

Methods and Materials: We studied 10 young males with OCD who underwent mosaicplasty. All patients were baseball players. Using an anechoic plastic sphere wavelet transform method, we measured three parameters of acoustic properties: signal intensity (index of cartilage stiffness), signal duration (index of cartilage roughness), and signal interval (index of cartilage thickness).

Results: The cartilage of the radius showed significantly lower signal intensity and higher signal duration than other sites. The cartilage of the OCD lesion had a lower signal intensity compared with the intact part. Although the macroscopic view showed that the cartilage surface was nearly intact in all patients, the signal intensity was significantly lower than healthy cartilage, our radial head patients than in early stage patients or intact part of the capitellum. The acoustic properties did not differ significantly between the plug and the intact part of the capitellum.

Conclusions: This study demonstrates the acoustic differences of the cartilage between the capitellum, radial head, and knee. To prevent further cartilage damage, early detection of OCD is important. After fixation of the plug, the condition of the plug and intact part of the cartilage was similar. We found no particular problems associated with transfer of the osteochondral plug from the knee to the capitellum.

P141

Osteochondral autologous transplantation surgery (OATS) in lapin models

L.V. Gulotta1, J.R. Rudzik1, D. Kovacevic1, C.C.T. Chen1, R.J. Williams2,3; New York, New York, United States of America, 1Sports Medicine/ shoulder, HSS, New York, New York, United States of America, 2Soft Tissue Laboratory, HSS, New York, United States of America

Purpose: Osteochondral autologous transplantation surgery (OATS) is used to treat isolated cartilage defects. In-vitro studies suggest the impact force used in OATS can cause chondrocyte death. The objective of this project is to determine the degree and type of chondrocyte death (necrosis or apoptosis) following OATS in a lapine model.

Methods and Materials: Twenty New Zealand White rabbits underwent unilateral OATS procedures and underwent bilateral sham surgeries. A 2.7-mm diameter, 4-mm deep osteochondral plug was harvested from the right medial femoral condyle and impacted into a defect created in the left medial femoral condyle. Fifteen animals were sacrificed immediately (10 OATS and 2 Sham limbs), 15 were sacrificed at 4 days (10 OATS and 7 Sham limbs). Cartilage degeneration was determined using modified Mankin Scoring, chondrocyte viability/necrosis was determined using cell vital stains, and chondrocyte apoptosis was determined by TUNEL assay. Statistical analyses were performed using Student's t-test and two-way ANOVA with significance level 0.05.

Results: There were higher modified Mankin Scores in the OATS group. Comparing the Sham group with 4-mm deep osteochondral plug and 2-mm deep OATS group, there were no significant differences in the degeneration scores. The 15-mm deep OATS group had significantly higher scores compared with the 4-mm deep OATS group (p<0.003). OATSs had lower Mankin scores compared with the Sham group (7.8±5.1 vs Sham: 15.1±12.3, p<0.001). A similar decrease in cell viability was found in the sham group. There was less TUNEL positive cells in OATS group (27.8±9.6% compared to other groups (p<0.001).

Conclusions: This study suggests the OATS procedure results in significantly more chondrocyte necrosis and apoptosis compared to controls.

P142

Tissue engineering combined with mosaicplasty technique to promote healing and integration of the osteochondral defects

X. Li1, G. Pei1, G. Guo1; 1Dept of Orthopaedics & Traumatology, Nanfang Hospital, Southern Medical University, Guangzhou, China, 2Dept Of Orthopaedics & Traumatology, Nanfang Hospital, Southern Medical University, Guangzhou, China

Purpose: To explore a new method combining BMSCs-mediated tissue-engineering and mosaicplasty technique, for repair of osteochondral defects and integration of gaps.

Methods and Materials: Autologous BMSCs from 18 goats were cultured and proliferated in vitro. Prior to cells harvest, osteochondral defects with 5-mm diameter and 3-mm depth, were created in the femoral condyle of both hind limbs. We used osteochondral autograft transplantation (mosaicplasty) was performed, the BMSCs, which had been harvested and compounded with hyaluronic acid, were injected into the gaps between osteochondral autographs. The defects were filled with acellular tissue served as blank control, and those received mosaicplasty plus hyaluronic acid injection served as negative control. At 2, 4, 8 and 16 weeks post-operatively, samples were harvested and assessed by histological evaluation, immunohistochemical analysis and glycosaminoglycan (GAG) quantification.

Results: The cartilage autographs in all groups survived with hyaline cartilage and represented no significant difference with surrounding native cartilage. In BMSCs group, the gaps disappeared and were replaced by regenerated hyaline cartilage; in control groups, the gaps remained replaced by fibrous or hyaline like cartilage and showed no clear distinction. Immunohistochemical analysis of typell collagen and aggrecan showed positive staining in the regenerated gap cartilage in BMSCs group. Alcian-blue method also confirmed a significant less GAG content in the regenerated tissue in gaps of control groups than that of BMSCs group and normal cartilage.

Conclusions: The strength of this study was to resolve the gaps integration and improve cartilage healing effect. BMSCs-mediated tissue-engineering combined with mosaicplasty could be an ideal way for osteochondral defects repair.

P143

Articular cartilage repair using in situ polymerizable hydrogel implants on osteochondral defects

D. Seliktar1, E. Peled1, M. Livnat1, Y. Tal1; 1Biomedical Engineering, Technion - Israel Institute of Technology, Haifa, Israel, 2Faculty Of Medicine, Technion - Israel Institute of Technology, Haifa, Israel, 3Cartilage Program, Regentis Biomaterials Ltd., Haifa, Israel, 4Cartilage Repair, Regentis Biomaterials Ltd., Haifa, Israel

Purpose: Bioactive and biodegradable materials in an osteochondral defect can promote the repair of the articular cartilage surface through induction and/or delivery of growth factors. We applied a biodegradable hydrogel made from PEGylated fibrinogen and polyethylene glycol (PEG) to an osteochondral defect in a sheep knee joint. The high composition of PEG relative to fibrinogen provided a non-porous structure with slow surface-based biodegradation matching the healing response of the osteochondral injury.

Methods and Materials: Four osteochondral defects (6-mm dia.) were created in the weight bearing zone of the femoral condyles of skeletally mature sheep and the acellular implants were polymerized in situ. The cartilage regeneration was assessed after six months and one year follow-up.

Results: Defects treated with the hydrogel implant exhibited regeneration of articular cartilage and bone around the eroding implant after 6 months. Empty defects exhibited fibrocartilage and extensive scar tissue formation. The extent of biodegradation of the implanted hydrogels was dependent on the ratio of PEG to fibrinogen; hydrogels with more PEG exhibited slower biodegradation. Histological sections stained for type II collagen and proteoglycans showed characteristic staining of hyaline cartilage above the newly formed bone bridge overtop the eroding implant. The implants were completely degraded from the injury site after one year follow-up.

Conclusions: We speculate that the fragments of fibrinogen released from the proteolytically degradable hydrogels induce mild but sustained normal tissue healing around the implant for several months and promote the formation of normal cartilage and stifles the proteolytic responsiveness of the non-porous implant with the normal healing kinetics of the osteochondral injury.