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Articular damage caused by metal plugs in a rabbit model for treatment of localized cartilage defects
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Purpose: Currently, the surgical treatment of localized cartilage defects has limitations. Alternatively, localized cartilage defects may be treated with small biocompatible metal cartilage tacks. Our purpose was to investigate the applicability of defect-size femoral implants. Cobalt-chromium (CoCr) and oxidized zirconium (OxZr) were tested to evaluate the effect on opposing cartilage quality and osseointegration at different insertion depths.

Methods and Materials: In eighteen NZW rabbits, a medial femoral condyle defect was filled with an OxZr or CoCr implant (diameter articulating surface 3.5-mm; fixing pin of 9.1-mm length), placed flush, 3-mm deep or 1-mm protruding with respect to the level of the surrounding cartilage. Animals were sacrificed after 4 weeks. Tissue quality was scored macroscopically and microscopically and osseointegration measured by automated histomorphometry.

Results: Considerable articular cartilage erosion was found in all circumstances. Tissue quality was least compromised when implants were placed flush compared to deep (p=0.03) or protruding position (p=0.004) and was better for OxZr compared to CoCr (p=0.01) when left protruding, while no differences found when placed deep of flush. Most bone formation around the fixing pin was observed in a protruding position (p=0.01). In deep position, more bone-implant contact was observed with CoCr compared to OxZr (p=0.02).

Conclusions: OxZr and CoCr implants showed good osseointegration when used as a localized cartilage defect treatment in the rabbit knee; however opposite cartilage damage was observed in all cases. Placement flush to the surrounding cartilage seems essential and when left protruding OxZr may be less erosive. Altogether, caution is warranted using small metal implants for the treatment of localized cartilage in the human patient.

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Cartilage regeneration with cartilage chips or chondrocytes under a collagen membrane in a full thickness defect goat model
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Purpose: Cell free methods for cartilage tissue engineering have recently gained increased focus. The biological response of such techniques needs to be tested in clinical relevant models. The present study aims to investigate the cartilage regenerative response of autologous cartilage chips and chondrocytes in combination with a collagen membrane in a goat femoral condyle full thickness cartilage defect model.

Methods and Materials: 8 adult goats were used for the study. A 6 mm circular defect was created in bilateral medial femoral condyles. Cartilage tissue was harvested for chondrocyte culture. At secondary open surgery the defects were randomized to the following treatment groups .1. Autologous chondrocytes combined with a collagen membrane (Chondrogide). 2. Cartilage chips placed under a collagen membrane. Animals were followed for 4 month. Analyses: ICRS macroscopic scoring. Mechanical stiffness test of regeneration tissue. Histological analyses was performed by O,Driscoll and Pinada.

Results: No difference was found in any of the tested parameters between the two groups. Generally the tissue filling of the defects were limited (35 %), and the macroscopic and histological scores were in the mid range indicating limited regeneration tissue with only minor cartilage characteristics. Mechanical testing demonstrated that the regenerated tissue was slightly stiffer than the normal cartilage.

Conclusions: No difference in cartilage regeneration was found between cartilage chips and autologous chondrocytes groups. The limited tissue regeneration response and the poor cartilage phenotypes characteristic can be caused by the biomechanical challenges of defect location at the weight bearing part of medial femoral condyles.

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Histological observations and ultrasound assessment of a full-thickness cartilage defect in a rabbit model
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Purpose: The purpose was to investigate ultrasound parameters of stiffness and thickness of reparative tissue in a full-thickness cartilage defect.

Methods and Materials: A defect (5-mm in diameter) was created in the left trochlea groove. Reparative tissue of the defect was assessed by histology, a polarized microscope and an ultrasound system at 2, 4, 8, 12, 24 and 52 weeks postoperatively (n = 3, respectively), and was compared to normal cartilage (control, n = 5).

Results: Histology showed no metachromasia by safranin-O in reparative tissue of 2- and 4-week specimens but of 8- to 24-week specimens. Cartilage thickness in the superficial layer was less than that in the middle layer. Reparative tissue of 52-week specimens, in which fibrillations and clefts were observed, had no metachromasia. Polarized microscope indicated that the quadrants of collagen and random orientation of collagen fibrils in reparative tissue. Ultrasound stiffness parameters of control, 2-, 4-, 8-, 12-, 24- and 52-week were 3.29 (arbitrary unit), 0.75, 0.35, 0.65, 0.97, 0.96 and 0.23, respectively. The parameters of 2- to 52-week were significantly (softer) than that of control (P < 0.05). Ultrasound measurement contributed to assess the fibrocartilage in degenerative process.

Conclusions: The defect was repaired with fibrocartilage. Fibrocartilage showed low ultrasound stiffness parameter during 52 weeks, then has deteriorated. Ultrasound measurement contributed to assess the fibrocartilage in degenerative process.

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Differences between hyaluronic acids (AdantTM vs OstenilTM) in the articular cartilage of the rabbit
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Purpose: To elucidate if the differences found in the physicochemical and rheological behaviour of hyaluronic acids results in a different in vivo activity. For this purpose two of them, OstenilTM and AdantTM were compared through an osteoarthritis model.

Methods and Materials: Osteoarthritis was induced in white New Zealand rabbits by anterior cruciate ligament section of both knees. After the induction period, the animals were allocated to receive AdantTM or OstenilTM intra-articularly in one knee, being used the contralateral knee as Untreated controls. An additional group of noninduced and noninjected animals was used as Healthy controls. Samples of cartilage from the same areas of each knee were taken for different measures: apoptosis, nitric oxide (nitrates) and hyaluronic acid in synovial fluid.

Results: The administration of AdantTM had a significant inhibitor effect on the apoptosis of the chondrocytes compared to untreated animals (p=0.0001), whereas this difference was not observed in the OstenilTM knees. Levels of nitrates by HPLC in the AdantTM knees were similar to those in the Healthy group (p=0.06) whereas they were significantly higher in both Untreated and OstenilTM groups (p=0.00003). The comparison between AdantTM and OstenilTM also revealed significantly lower levels of nitrates by HPLC in the AdantTM knees (p=0.00001). Values of hyaluronic acid in synovial fluid did not show statistical differences between the different study groups.

Conclusions: AdantTM and OstenilTM showed different physico-chemical characteristics and these differences have resulted in a different in vivo behaviour. In consequence, both products cannot be considered as equivalent.