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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, 2 mm deep or 1 mm protruding with respect to the level of the surrounding cartilage. Animals were sacrificed after 4 weeks. Tibial cartilage quality was scored macroscopically and microscopically and osseointegration measured by automated histomorphometry.

Results: Considerable articulating cartilage erosion was found in all cartilages. Tibial cartilage 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=0.013) 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 cell free methods for cartilage tissue engineering has recently been the focus of several studies. Recently, the biological response of such cell free methods has been shown to be equivalent to that of autologous chondrocyte implanted in a collagen membrane in a full thickness defect goat model.

Methods and Materials: In eighteen NZW rabbits, a medial femoral condyle full thickness cartilage defect was created in the left trochea 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. Mechanical property testing demonstrated that the regenerated tissue was slightly stiffer than the normal cartilage.

Conclusions: The limited tissue regeneration response and the poor cartilage characteristics. Mechanical testing demonstrated that the regenerated tissue was slightly stiffer than the normal cartilage. No difference in cartilage regeneration was found between cartilage chips and autologous chondrocytes groups. The limited tissue regeneration response and the poor cartilage characteristics can be caused by the biomechanical challenges of the defect location at the weight bearing part of medial femoral condyles.