Objective: To determine if collagen type III deposition in osteoarthritic articular cartilage is a significant contributor to the pool of collagen.

Method and material: Site matched cartilage of 10 femoral heads from OA and fracture patients (reference cartilage) were examined. Femoral heads were obtained from surgery of total hip replacement due to OA and femoral neck fracture. Cartilage was pulverized and treated by chymotrypsin, an enzyme which selectively extracts damaged collagen. The amount of collagen in both the extract and the remaining residue was determined in each case (Figure 2). Cartilage tissues are then fixed in the loaded state and prepared for histology. Mechanical and histological differences between intact and cracked samples are measured.

Results: Fibrillation and loss of Safranin O staining of the cartilage surface were observed in control siRNA group. Improvement was observed in the histological score in both treated group compared to the control siRNA injected group. Especially in combined siRNA group, the score was lower than MMP13 siRNA group.

Conclusions: Combined treatment with MMP13 siRNA and ADAMTS5 siRNA intra-articular injection can be expected to inhibit cartilage degradation at the early phase of OA development compared to treatment MMP13 siRNA alone.

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660 DEFORMATION PATTERNS OF CRACKED ARTICULAR CARTILAGE UNDER COMPRESSION

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Purpose: It is widely accepted that the mechanical environment surrounding cartilage cells (chondrocytes) has a regulatory role on their metabolism.1 Very early Osteoarthritis (OA) is associated with changes in the collagen fibril orientation of the superficial zone of cartilage leading to small structural changes and micro-cracks of the cartilage surface.2 These cracks are thought to alter chondrocyte’s mechanical environment and hence their metabolism.3 In this study, we assess the differences of cartilage deformation patterns between intact and cracked cartilage.

Methods: Articular cartilage split line patterns of New Zealand white Rabbits are identified using India ink (Figure 1). http://files.abstractsonline.com/CTRL/79/8/EF3/271/E27/404/CA3/88B/B19/B3A/303/3F/g301_1.jpg Cracks are made at full thickness of cartilage at 90°, 45° or 20° to the cartilage surface and oriented parallel or perpendicular to the split lines. Controlled load (2 MPa) is applied and stress relaxation is measured in each case (Figure 2). Cartilage tissues are then fixed in the loaded state and prepared for histology.4 Mechanical and histological differences between intact and cracked samples are measured.

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Figure 1. Split line pattern on Rabbit femur.

Figure 2. Rabbit Femur mounted on sample holder in MTS machine. a, Blade is lowered to induce a full thickness crack. b, Indentor is lowered to apply the load.

Results: The split line patterns of patella, femur, and tibia were found to be consistent over seven knee joints harvested from New Zealand white rabbits allowing us to proceed to the next step of introducing cracks. Preliminary results show around 10% deeper indentations in cartilage cracked perpendicular to the split lines vs. intact cartilage with around 20% reduction in time to reach a steady-state plateau after stress relaxation (Figure 3).
intervention to normalize cell deformation and signaling in early OA, or pharmacological intervention to neutralize catabolic enzymes known to be released in chondrocytes near tissue cracks.

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ASSOCIATIONS BETWEEN POPLITEAL ARTERY WALL THICKNESS AND KNEE STRUCTURE IN ADULTS WITHOUT CLINICAL KNEE DISEASE: A PROSPECTIVE COHORT STUDY

Purpose: There is evidence for a vascular contribution to the pathogenesis of osteoarthritis. Our aim was to use an asymptomatic cohort to examine the association between popliteal artery wall thickness, previously shown to be associated with risk of generalized osteoarthritis, and knee structural changes.

Methods: 297 adults with no significant knee pain, injury, or history of clinical knee disease were recruited. Participants underwent knee magnetic resonance imaging at baseline and 2 years later. Popliteal artery wall thickness, knee cartilage volume and bone marrow lesions (BML) were assessed.

Results: Of 278 participants with valid popliteal artery wall thickness measurement, 254 (91.4%) completed 2-year follow-up. After adjusting for age, gender, body mass index and tibial bone area, increased popliteal artery wall thickness was associated with reduced medial tibial cartilage volume (B = –6.7, 95% CI –12.9, −0.6, p = 0.03) and increased rate of medial tibial cartilage volume loss (B = 0.06, 95% CI 0.01, 0.12, p = 0.03). There was a trend for medial tibiofemoral BML deterioration in relation to increased popliteal artery wall thickness (odds ratio=1.07, 95% CI 0.99, 1.15, p = 0.07). No significant associations were observed with lateral tibiofemoral compartment.

Conclusion: Increased popliteal artery wall thickness was associated with adverse changes in knee structure, as evidenced by reduced medial tibial cartilage volume, increased rate of cartilage volume loss and a trend for BML deterioration over 2 years. These findings suggest an association between vascular pathology and early knee structural changes, supporting the hypothesis that vascular health may play a role in the development of knee osteoarthritis.

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ASSOCIATIONS BETWEEN LEVELS OF URINARY C-TELOPEPTIDE FRAGMENTS OF TYPE II COLLAGEN AND KNEE STRUCTURE IN MIDDLE-AGED WOMEN WITHOUT CLINICAL KNEE DISEASE

Purpose: There is evidence for an association between levels of urinary C-telopeptide fragments of type II collagen (uCTX-II) and risk of knee osteoarthritis. The aim of this study was to examine the association between uCTX-II levels and knee cartilage and bone changes in middle-aged women without clinical knee disease.

Methods: 140 women, aged 40 – 67 years, with no significant knee pain, knee injury or any forms of arthritis, underwent knee MRI at baseline and two years later. Cartilage volume, cartilage defects, tibial plateau bone area and bone marrow lesions (BMLs) were measured using validated methods. Baseline uCTX-II was measured using ELISA.

Results: A higher baseline uCTX-II level was associated with increased prevalence of medial tibiofemoral cartilage defects (OR 4.36, 95%CI 1.58–12.04), greater medial (regression coefficient 86.0, 95%CI 33.3–138.7) tibial plateau bone area, and increased prevalence of lateral tibiofemoral BMLs (OR 10.62, 95%CI 1.82–61.85). Baseline uCTX-II levels were not significantly associated with baseline tibial cartilage volume or changes in knee cartilage (volume and defects) or bone (bone area and BMLs) over two years.

Conclusion: In middle-aged women without clinical knee disease, higher uCTX-II levels were associated with detrimental changes in knee cartilage and bone cross-sectionally but not over two years. This suggests that uCTX-II may be a sensitive biomarker of early structural features of knee osteoarthritis. Further work will be needed to determine its sensitivity to change and whether it predicts progression of disease over longer time periods.