Point of no return for improvement of cartilage as indicated by dGEMRIC before and after weight loss in patients with knee osteoarthritis: A cohort study

Stine Hangaard\textsuperscript{1,2}, Henrik Gudbergsen\textsuperscript{2,3}, Marie Skougaard\textsuperscript{2}, Henning Bliddal\textsuperscript{2}, Rasmus Bouert\textsuperscript{1}, Robert GC Riis\textsuperscript{1,2}, Carl Siversson\textsuperscript{4}, Carl Johan Tiderius\textsuperscript{5} and Mikael Boesen\textsuperscript{1}.

\textsuperscript{1}Department of Radiology, Copenhagen University Hospital, Bispebjerg-Frederiksberg, Denmark
\textsuperscript{2}The Parker Institute, Dept. of Rheumatology, Copenhagen University Hospital, Bispebjerg- Frederiksberg, Denmark
\textsuperscript{3}Knowledgecentre for Telemedicine, Capital Region, Denmark
\textsuperscript{4}Medical Radiation Physics, Department of Clinical Sciences, Lund University, Skåne University Hospital, SE-205 02 Malmö, Sweden
\textsuperscript{5}Department of Orthopaedics, Lund University, Skåne University Hospital, SE-221 85 Lund, Sweden

**Purpose:** To assess if weight loss can improve the quality of hyaline cartilage in patients with Knee Osteoarthritis (KOA). Cartilage quality was assessed via delayed Gadolinium Enhanced MRI of Cartilage (dGEMRIC) in obese patients (BMI>30) with varying degrees of KOA using a 1.5 tesla (T) MRI scanner.

**Method and materials:** 19 patients with symptomatic KOA from a 16-week weight loss interventions study were included from the CAROT trial NCT00655941. Standing x-ray of target knee joints were K/L (Kellgren/Lawrence) scored for both lateral and medial tibiofemoral compartments. Patients with K/L-grade 1 and 2 in the lateral compartment were included. K/L 3 and 4 were excluded due to the minimal quantity of cartilage. Inversion recovery dGEMRIC with four inversion times (50, 350, 650, 1410 ms) was performed in the target knee using intra articular contrast at baseline and after 16 weeks of intervention (weight loss). Regions of interests (ROI)s were drawn around the posterior weight-bearing femoral knee cartilage delimited of the posterior menisci on sagittal MRI scans. dGEMRIC T1-values were calculated at baseline and after 16 weeks of intervention. Differences in weight loss and dGEMRIC T1-values were compared between the two groups.

**Results:** 9 patients with K/L 1 and 10 patients with K/L 2 were included. There were no group differences regarding baseline dGEMRIC T1-values: Mean 467 ms for K/L 1, and 518 ms and for K/L 2 (p = 0.11), or regarding weight loss after 16 weeks, 12.3 % and 14.3 % of BMI, respectively (p = 0.37). After 16 weeks of intervention the average dGEMRIC T1-value increased with approximately 28 ms (CI: -29; 86) in K/L-group 1, while the average dGEMRIC T1-value decreased 61 ms (CI: -116; -7) for K/L-group 2. Taking baseline dGEMRIC into account, the dGEMRIC changes between groups shows the same trend, although less pronounced (P= 0.11). Reproducibility was similar to previous publications with ICCs of 0.96 for intra-reader and 0.92 for inter-reader variability.

**Conclusion:**
Our results indicate that improvement of cartilage quality after weight loss may be possible in early state KOA (K/L 1), but not in later stage KOA (K/L 2). The dGEMRIC results may suggest a point of no return for
improvement of cartilage quality. No other previous studies have assessed this for patients with KOA. The results are similar to the results seen in predominantly knee-healthy patients one year after weight loss. Further studies in a larger scale are necessary to verify this hypothesis.

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