Conclusions: Location-specific computer measures of JSW are feasible and potentially provide a more disease sensitive method to assess disease progression than mJSW in patients with OA. This method could prove useful to improve the power of clinical studies. In the future we anticipate performing this study with a larger number of subjects to establish a statistically significant difference between the two methods.

Acknowledgments: We would like to acknowledge the Health ABC Study for providing data.

A18

THE LOSS OF CARTILAGE VOLUME/THICKNESS ON THE WEIGHT BEARING AREAS IN KNEE OSTEOARTHRITIS PATIENTS, ASSESSED BY QUANTITATIVE MRI, IS CORRELATED WITH SEVERITY OF SYMPTOMS AND WORSENING OF PAIN OVER TIME

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Purpose: To explore on a symptomatic knee osteoarthritis (OA) cohort the correlation of the subregion of cartilage volume/thickness changes over 2 years as assessed by quantitative magnetic resonance imaging (qMRI) with demographic, clinical, radiological and MRI knee structure data, in order to better identify the risk factors of OA progression.

Methods: A cohort of 107 OA patients with the mean age of 62.4, 64.4% female, and average BMI of 30.6 kg/m² was studied. Patients with Kellgren-Lawrence grade IV radiographs were excluded. MRIs of the knee were analyzed at baseline and 2 years. Cartilage volume of the different subregions of the tibial plateau and femoral condyles was quantitated. The structural changes of bone edema and meniscal tear and extrusion were evaluated using semi-quantitative scales.

Results: The proportionally greatest cartilage volume/thickness loss at 2 years was found in the central portion of the medial tibial plateau (15%; p < 0.0001) and of the medial femoral condyle (12.0%; p < 0.0001). In the tibial plateau, greater cartilage loss was associated with medial meniscal extrusion (p < 0.0001), severe medial meniscal tear (p = 0.009), bone marrow edema (p = 0.003), high body mass index (BMI; p = 0.01), pain worsening (p = 0.02), and joint space width (JSW) narrowing (p = 0.03). In a multivariate stepwise forward regression, the severe medial meniscal extrusion (p = 0.002) and pain worsening (p = 0.05) were associated with cartilage loss in this subregion. In the medial femoral condyle, the associations with greater cartilage loss were severe medial meniscal tear (p < 0.001), medial meniscal extrusion (p < 0.001), JSW narrowing (p < 0.0001), bone marrow edema (p = 0.006), and high BMI (p = 0.01). In a multivariate stepwise forward regression, severe medial meniscal tear (p < 0.006), JSW change at 2 years (p = 0.0005), and total WOMAC at baseline (p = 0.06) were the most closely associated.

Conclusions: Meniscal damage and bone marrow changes are the most closely associated features with subregional cartilage volume/thickness loss. Interestingly, for the first time, the JSW narrowing was also demonstrated to be strongly associated with cartilage loss in weight bearing areas. This reflects that JSW change at its narrowest point may be closely related to cartilage loss in specific subregions. These data also further confirm the correlation between cartilage volume loss and symptomatic changes at 2 years.

A19

EARLY CHANGES OF CARTILAGE T2 TIME IN DYSPLASTIC HIPS USING 3.0 T MRI

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Purpose: Hip dysplasia is one of the major causes of hip osteoarthritis, and early detection of cartilage disorder in dysplastic hips is important for detailed assessment of cartilage pathology and determination of appropriate timing of osteotomy surgery. Evaluation of T2 relaxation time (T2 time) using MR imaging showed great potential for qualitative assessment in the knee cartilage, however, few reports assessed hip cartilage by T2 time because of difficulty in obtaining satisfactory image quality and in differentiation between the acetabular and femoral cartilages. MR imaging at higher magnetic field strength (≥ 3 T) may provide improved image quality of the hip cartilage due to superior signal-to-noise contrast. Our objectives were to assess the feasibility of T2 time using MR imaging at 3.0T for evaluation of early qualitative changes in the acetabular and femoral cartilages with hip dysplasia.

Methods: Three asymptomatic normal volunteers (3 hips) and 4 symptomatic patients with hip dysplasia (5 hips) were imaged on a GE 3.0 T MRI scanner using a flexible surface coil. All participants were female, and the mean age of the volunteers and the patients were 29 years and 39 years, respectively. In the 5 dysplastic hips, 3 hips showed no osteoarthritic changes (pre-arthritic group) and 2 hips showed slight joint space narrowing (early-arthritic group) on plain radiographs. A two-dimensional dual-echo spin-echo sequence with fat-suppression was used (TR/TE, 1500/10 and 45 ms; FOV, 16 cm; matrix, 512X512 interpolated to 512X512; 5mm slice thickness) to generate a sagittal T2 time map. On the mid-sagittal image, anterosuperior (AS) and superior (S) zones in the acetabular and femoral cartilages were manually segmented. Visual appearance of T2 mapping in the cartilage was classified into normal pattern (low T2 at the deep cartilage area and high T2 at the superficial cartilage area), and abnormal pattern. The appearance of T2 mapping and T2 values in each zone were compared between the normal, pre-arthritic and early-arthritic hips.

Results: All normal hips showed normal pattern of T2 mapping in all examined zones, however, all dysplastic hips showed abnormal pattern in AS and S zones of the acetabular cartilage. Interestingly, pre-arthritic hips were likely to show decreased T2 time in the superficial area of the acetabular cartilage, while early-arthritic hips were likely to show disorganized T2 time distribution in the deep and superficial area of the acetabular cartilage (Fig. 1). Mean T2 time at the AS/S zones of the acetabular cartilage was lower in pre-arthritic hips (26.7±29.0 ms), but was considerably higher in early-arthritic hips (38.8±39.9 ms), as compared with normal hips (29.8±30.3 ms). Mean T2 time at the AS and S zones of the femoral cartilage was relatively higher in pre-arthritic and early-arthritic hips, as compared with normal hips.