

Abstract 308 – Table 1

	Medial Tibial		P value for difference	Medial femur		P value for difference
	BML	Unaffected by BML		BML	Unaffected by BML	
K^{trans} (1/min)	0.03 (0.02)	0.02 (0.02)	0.018	0.03 (0.03)	0.02 (0.01)	0.188
IAUC	0.14 (0.09)	0.05 (0.03)	0.066	0.13 (0.08)	0.04 (0.02)	0.074
V_e	0.43 (0.39)	0.10 (0.12)	0.274	0.29 (0.25)	0.06 (0.05)	0.080
k_{ep}	12.44 (9.23)	7.13 (7.66)	0.012	10.07 (6.66)	5.68 (5.75)	0.017

area under curve (IAUC), defined as the area under the tissue uptake curve during the first 90 seconds following bolus injection normalized by the area under the AIF over the same period; K^{trans} , the volume transfer constant between blood plasma and extra-cellular extra-vascular space (EES); and k_{ep} , the rate constant between the extracellular space (V_e) and blood plasma which provides an index of the presence of venous hypertension. Statistical comparisons were made within person between regions affected by BML and those that were not affected on both the tibial plateau and femur (for example BML in medial tibia compared to region of medial tibia not affected by BML).

Results: The table depicts the mean (SD) values of perfusion obtained from dynamic contrast enhanced imaging in the different regions of the knee affected and unaffected by BML of six individuals (ranging in age from 48-90 years of age) that were scanned.

Conclusions: Areas of bone affected by BML in knee OA are associated with altered perfusion and intraosseous venous hypertension (k_{ep}) in both the tibial plateau and femur while increased permeability (K^{trans}) was observed in the tibial plateau only. The increase in k_{ep} may be due to the result of obstruction of venous drainage from the affected bone although the causative factor is not yet known. These alterations in bone perfusion and hypertension may be responsible for the bone-remodeling as well as the necrosis of bone occurring in patients with knee OA.

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TWELVE MONTH LONGITUDINAL CHANGE IN REGIONAL CARTILAGE MORPHOLOGY IN A MULTICENTER, MULTIVENDOR MRI STUDY AT 3.0 TESLA - THE A9001140 STUDY

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Purpose: Clinical trials for DMOAD evaluation require sensitive methods for detecting significant changes in articular structures over relatively short time periods. Here we investigate whether significant change in regional cartilage morphology can be detected in an enriched OA population (i.e., obese women) in a multicenter, multivendor MRI study at 3Tesla over a period of 12 months.

Methods: 1.0mm coronal FLASHwe MR images of the knee were acquired at baseline and 12 months in 158 female subjects at 7 clinical centers with Siemens and GE scanners. 96 subjects had no symptoms and no evidence of radiographic OA; 62 had medial femorotibial OA on conventional standing AP radiographs (31 Kellgren and Lawrence (KLG) 2 and 31 KLG 3). 7 experienced readers segmented the baseline and follow up images as pairs, with blinding to order of acquisition; all segmentations were quality controlled. The mean cartilage thickness over the entire subchondral bone area (tAB) was computed (ThCtAB). Subregional cartilage thickness was determined for central, anterior, posterior, external and internal subregions of the medial (MT) and lateral tibia (LT), and the weight-bearing medial (cMF) and lateral femur (cLF), using proprietary software (Chondrometrics).

The mean change (MC%) and the standardized response mean (SRM = mean/SD of the change) were calculated.

Results: At 12 months, little to no changes were observed in the medial compartment in control subjects (KLG 0), the greatest change being an increase in the ThCtAB in the internal subregion of the MT (SRM=0.20; $p<0.05$). In contrast, in OA subjects, trends to a reduction in the ThCtAB were observed in most cartilage plates in the medial compartment (KLG2 subjects: -0.6%/SRM=-0.19 in MT; KLG 3 subjects: -2.0%/SRM=-0.28 in cMF; $p<0.05$). In the central and external subregions of MT reductions in the ThCtAB attained SRM values of -0.32 and -0.26 in KLG 2 subjects, respectively; in KLG 3 subjects the highest SRM was observed in the external subregion (SRM=-0.22). Increases in ThCtAB were observed in the anterior or posterior subregions of the MT in KLG 3 subjects (SRMs of up to +0.24). In the cMF subregions, reduction in the ThCtAB reached 2.4% in the external (SRM=-0.24) and 4.4% in the central (SRM=-0.40; $p<0.05$) subregions in KLG 3 subjects. In contrast, in the lateral compartment the most significant changes appeared to be increases in ThCtAB. In cLF up to 2% increases in ThCtAB were observed with the most significant changes observed in the internal region in KLG 2 subjects (SRM=+0.38; $p<0.05$) and in the external and central regions (SRM=+0.38; $p<0.05$ and +0.32 respectively) in KLG 3 subjects. In cLT, at the total plate level no changes were observed likely related to a cancelling effect of both increases and decreases in certain subregions. In KLG 2 subjects, increases up to 2% in the external and posterior regions were observed (SRM=+0.40; $p<0.05$ and +0.35 respectively) and in KLG 3 subjects increases up to 2.8% were observed in the anterior region (SRM=+0.40; $p<0.05$).

Conclusions: Little to no changes in cartilage thickness were observed in control subjects at 1 year. Relatively small changes in cartilage thickness were observed at total plate level in KLG 2 and 3 subjects over 1 year, mostly including reductions in the medial compartment and increases in the lateral compartment. Subregional analysis revealed greater sensitivity to change in cartilage thickness in some subregions, including reductions in the external and central subregions of MT and cMF.

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DIAGNOSTIC PERFORMANCE OF IN VIVO MRI FOR ARTICULAR CARTILAGE ABNORMALITIES IN HUMAN OSTEOARTHRITIC KNEES USING HISTOLOGY WITH SAFRANIN-O STAINING AS STANDARD OF REFERENCE

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Purpose: To evaluate the sensitivity and specificity of in vivo 3T Magnetic Resonance Imaging (MRI) in the assessment of cartilage pathologies of the knee, by using histology as the reference standard in patients undergoing total joint replacement.

Methods: Eight knees of seven patients (3 males and 4 females, average age 65.6 years) with advanced osteoarthritis of the knee and scheduled for total joint replacement were examined with 3T