of the identical (a.p.) view the ICCs were 0.82 (95% CI 0.80-0.84) ranging from 0.67 to 0.85. Intra-reader reliability was 0.93 (95% CI 0.92-0.94) ranging from 0.86 to 0.98. Finally, inter-observer reliability was 0.96 (95% CI 0.88-0.99). A decrease in reliability was observed for increasing voxel sizes. Table 1 gives a detailed overview of the reliability results.
Conclusions: Reliability measurements of FSA showed that the method is potentially applicable in a clinical setting on a young patient population. However, radiographic technique appears to have a relevant influence on reliability including a.p. and p.a. projections, uni- vs. bilateral image acquisition and repeated measurements acquired in identical fashion, which was not recognized previously. The inter- and intra-observer reliability was excellent also in this young clinical cohort, which confirms previous reports from OA studies.

	a.p. vs. p.a.	Unilateral vs. bilateral	Identical view repeated	Intra-observer	Inter-observer
Number of knees	N=102	N=27	N=46	N=100	N=100
All dimensions combined	0.72 95% CI (0.70, 0.74)	0.79 95% CI (0.76, 0.82)	0.82 95% CI (0.80, 0.84)	0.93 95% CI (0.92, 0.94)	0.96 95% CI (0.95, 0.96)
Fractal dimension (in mm)					
0.286	0.81	0.89	0.85	0.98	0.99
0.429	0.84	0.88	0.85	0.96	0.98
0.572	0.79	0.86	0.84	0.95	0.98
0.715	0.76	0.84	0.82	0.94	0.97
0.858	0.71	0.81	0.82	0.93	0.95
1.001	0.66	0.76	0.81	0.90	0.94
1.144	0.62	0.75	0.76	0.89	0.93
1.287	0.58	0.70	0.73	0.87	0.92
1.430	0.52	0.60	0.73	0.87	0.92
1.573	0.47	0.55	0.67	0.86	0.88

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IS PHASE-CONTRAST COMPUTED TOMOGRAPHY MORE SENSITIVE THAN MAGNETIC RESONANCE IMAGING IN QUANTIFYING CARTILAGE DAMAGE IN OSTEOARTHRITIS?

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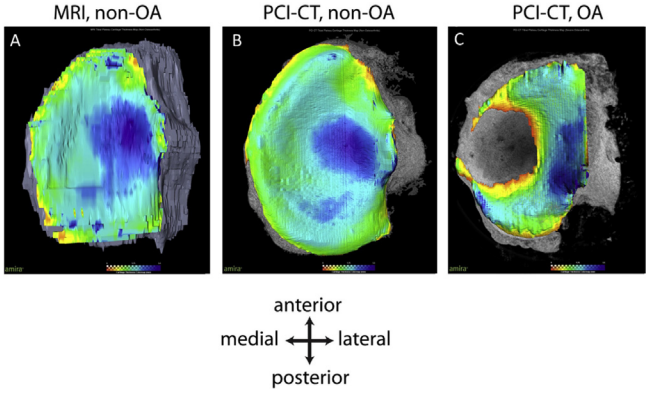
Purpose: Articular cartilage, damaged in Osteoarthritis, remains a challenging tissue to accurately characterize using clinical imaging techniques. This project quantitatively compares the use of magnetic resonance imaging (MRI) and synchrotron based phase-contrast-imaging computed tomography (PCI-CT) in making clinically relevant, three-dimensional assessments of articular cartilage.
Methods: The medial tibial plateau of disarticulated human knee joints from four healthy and four osteoarthritic donors was imaged using PCI-CT at 45 keV and MRI technique, 3D FLASH. The respective pixel resolutions were 28 and 313 micron. Using commercial software, computed tomography data was manually segmented to generate three-dimensional surface reconstructions of the plateau cartilage, thus permitting quantitation of its total volume and average thickness.
Results: PCI-CT effectively visualizes articular cartilage, differentiating it from other tissues and surrounding synovial fluid (simulated by a phosphate buffered saline solution). The ten-fold resolution advantage of PCI-CT over MRI, allowed for very accurate characterization of articular cartilage. PCI-CT yielded statistically significant lower "average thickness" measures of articular cartilage compared to MRI.
Conclusions: PCI-CT may be more sensitive than MRI in quantifying early deterioration of articular cartilage. The knowledge obtained from this project supports efforts to, eventually, increase the diagnostic and preventative capabilities in Osteoarthritis. Improved imaging would enhance the ability to characterize tissue changes that occur in Osteoarthritis in vivo, and better relate these changes to patient symptoms.



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RELATIONSHIP BETWEEN THE GUT MICROBIOTA, LIPOPOLYSACCHARIDE, INFLAMMATION, AND METABOLIC OSTEOARTHRITIS DEVELOPMENT: STUDIES IN A RAT MODEL

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Purpose: Western-type diets – high in fat and sugars – often lead to obesity. Obesity in turn is associated with chronic inflammation, through metabolic dysfunction, which may be a key risk factor for the onset and increased rate of progression of a metabolic osteoarthritis (OA) subtype. Growing evidence supports the link between obesity and changes in the composition of the bacteria that reside in the gastrointestinal system, collectively termed the gut microbiota. Recently, the role of the gut microbiota in activation of the innate immune response, leading to systemic inflammation and OA, has been proposed as a novel, unexplored mechanism in the context of metabolic osteoarthritis. The purpose of this set of studies was to evaluate gut microbiota changes induced by intake of a high fat/high sucrose diet in the context of OA, and subsequent associations of gut microbial profiles with serum and synovial fluid cytokine and adipokine profiles, and knee joint damage.
Methods: Thirty-two male Sprague-Dawley rats (8-12 weeks old) were randomly separated into two groups: a high fat/high sucrose diet induced obesity (DIO) (n=21, 40% fat, Diet #102412, Dyets, Inc) group and a control (n=11, LFD, 13.5% fat, LabDiet 5001) group. After a twelve-week obesity induction period, DIO animals were tertile stratified into an Obesity Prone (DIO-P, Top 33% of animals by change in body mass over twelve weeks, n=7), and an Obesity Resistant (DIO-R, bottom 33% of animals by change in body mass over twelve weeks, n=7) group. Animals were followed for an additional 16 weeks and sacrificed. At sacrifice, synovial fluid and blood were collected and evaluated by Eve Technologies, Calgary, AB using a Rat Cytokine Array/Chemokine Array 27-Plex Panel (EMD Millipore) detected by Luminex xMAP. OA damage was determined by a Modified Mankin Scoring System. Systemic lipopolysaccharide (LPS) was evaluated using EndoZyme Recombinant Factor C Assay (Hyglos GmbH, Germany). Profiling of 13 microbial groups was performed using qPCR. All statistical tests were performed at α=0.05.
Results: DIO-P rats were heavier than both DIO-R and chow controls by week 9 of the obesity induction period and remained heavier through the remainder of the study ($p<0.05$). At sacrifice, though DIO-R and chow animals had similar mass (DIO-R: 896 ± 43 g, CHOW 823 ± 19 g, p=0.25), both DIO-P and DIO-R animals had increased body fat compared to chow controls at sacrifice (DIO-P: 56.7 ± 1.7%, DIO-R: 42.8 ± 1.5 %, CHOW: 29.5 ± 2.5%, $p<0.001$). All DIO animals had greater Modified Mankin scores than lean animals (Median and {Interquartile range}: DIO: 50 {40-63}, CHOW: 26 {22-38} p=0.002). There was a positive significant relationship between body fat percentage (r=0.60, p=0.001) and Modified Mankin score across all animals. However, no statistically significant relationship was found between body mass and Modified Mankin score. Despite having more mass, DIO-P animals did not demonstrate higher Modified Mankin Scores than DIO-R (p=0.8). Eighteen synovial fluid analytes and four serum analytes were increased in DIO animals compared to control animals, and synovial fluid IL-1α was positively associated with Modified Mankin Scores across all animals (r=0.48, p=0.03). Circulating LPS levels were higher in all DIO animals compared to chow animals (LPS DIO 2.18 ± 0.02 log eu/mL, lean 2.06 ±