

body mass index, and mechanical knee alignment. For the Inc Sx study, we also adjusted for baseline Kellgren & Lawrence grade.

Results: 147 case knees (mean age=62.7 (8.4), mean BMI=29.6 (4.6), 68% women, 87% White, 20% K&L grade ≥ 2) and 327 control knees (mean age=61.4 (8.1), mean BMI=29.7 (4.5), 60% women, 87% White, 9% K&L grade ≥ 2) were in the Inc Sx study. Inc Sx were only associated with baseline lateral meniscal cyst. 79 case knees (mean(SD): age=61.7 (8.2), BMI=31.2 (5.5), 67% women, 81% White) and 157 control knees (mean age=62.2 (8.0), mean BMI=29.1 (4.7), 66% women, 89% White) were in the Inc ROA study. Inc ROA was associated with baseline Baker cyst. Few knees had lateral meniscal cyst, so we did not assess its relation with Inc ROA (see Table 1).

Conclusions: Since meniscal cysts are usually associated with a horizontal meniscal tear which is painful, it is not surprising that incident knee pain is associated with lateral meniscal cyst. Our study also confirms that moderate to large Baker cysts are associated with incident radiographic OA.

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DETECTION OF EARLY COMPARTMENTAL DEGENERATIVE CHANGES IN A RAT MODEL FOR OA USING HIGH RESOLUTION MULTI PINHOLE SPECT-CT

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Purpose: Radionuclide bone scanning is a highly sensitive method for identifying early degenerative changes in the subchondral bone as a consequence of osteoarthritis (OA) in patients. Till recently, this imaging modality was not applicable for in-vivo monitoring of experimental knee OA in small animal models such as mice and rats. Due to its lack in high resolution, the growth activity of the metaphysis, which is active in mice and rats during their entire life span, interfered with the signal of activity of the subchondral bone. Furthermore, it would have not been possible to differentiate changes in the different knee compartments. With the recent development of multi-pinhole single photon emission computed tomography (mph-SPECT) it is possible to monitor molecular processes in mice and rats at sub-millimetre resolution. When mph-SPECT is combined with μ CT, exact skeletal anatomic information of the location of the SPECT tracers can be obtained. The aim of this study was to assess the capabilities of mph-SPECT/CT for compartmental monitoring of experimental AO in a rat.

Methods: We induced OA in the right knees of 18 Wistar rats by injection of 1 mg mono-iodoacetate (MIA). An equal amount of saline was administered to the left knees, which served as the control condition. At 2 (n=18), 14 (n=12) and 42 (n=6) days after induction of OA, the knees of the animals were scanned with mph-SPECT/CT (Nano-SPECT/CT, Bioscan, Germany; resolution: 330 μ m; acquisition-time: 30 min.; 4 gamma cameras with apertures which contained 9 pinholes each). At each time-point 6 animals were sacrificed for evaluation of the cartilage and bone by means of histology. 4 hours prior to scanning the animals were intra-venous injected with 185 mBq of radioactive technetium bound to methylene-diphosphonate (^{99m}Tc -mdp) that incorporates into newly formed bone. After fusion of the mph-SPECT and μ CT images, alterations in subchondral bone turnover in the medial and lateral condyles were evaluated separately by comparison to the normal rate of bone turnover of their contra-lateral counterpart (left knee).

Results: A clearly increased turnover was found in the subchondral bone of all medial condyles of the OA induced knees relative to their contralateral control. After 2 days of OA induction a 53% increase of bone turnover was detected (Fig. 1). Histology at

this time point only showed a slight decrease in proteoglycan content in the cartilage. At 14 and 42 days post induction of OA the subchondral bone turnover of the medial condyles increased to 56% respectively 105% compared to their contra-lateral counterpart. No significant alterations in subchondral bone activity of the lateral femoral condyles were detected.

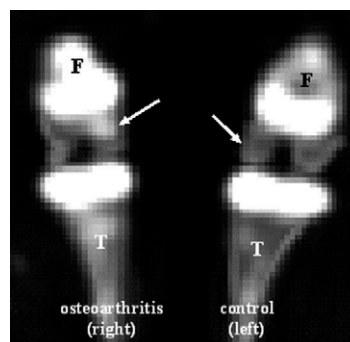


Figure 1. Fusion of mph-SPECT scan (white-yellow) and anatomical μ CT image (grey) of both rat knees (coronal plane) at 2 days post induction of OA. T = tibia, F = femur. The metaphysis of both tibia and femur are highly activated, the medial femoral condyle of the OA knee shows higher turnover as its contralateral counterpart (white arrows).

Conclusions: For the first time the capabilities of high resolution mph-SPECT/CT for assessment of OA have been shown. Mph-SPECT/CT can detect very early changes in subchondral bone turnover as a consequence of OA in which only slight alteration in cartilage proteoglycan content could be detected by histology. Furthermore, the different compartments of the knee could be assessed separately. In conclusion, mph-SPECT/CT appears to be a highly sensitive imaging modality for the assessment of developing OA in small animal models.

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ALTERED PERFUSION AND VENOUS HYPERTENSION IS PRESENT IN REGIONS OF BONE AFFECTED BY BMLs IN KNEE OA

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Purpose: Prior studies in the hip suggested that OA was associated with increased intraosseous pressures, which were thought to be the result of obstruction of venous drainage from the affected bone. It has been suggested that elevated intraosseous pressure is responsible for the bone-remodeling as well as the necrosis of bone occurring in patients who have these diseases. Our objective was to determine if bone marrow lesions are sites of venous (osseous) hypertension and thus show reduced runoff compared to surrounding normal tissue.

Methods: Postmenopausal female subjects with predominantly medial compartment OA, on a waiting list for total knee replacement (TKR), were recruited under ethical consent. Subjects had an MRI performed on their study knee using a Philips 3.0T scanner with a dedicated extremity coil. The following dynamic contrast enhanced imaging sequence was used on each patient: Axial 3D FSPGR flip angle 25 TE min full, RCV BW 42-62, FOV ~12, 3mm slices acquired over 3 minutes interval, 14 loc per slab, 256x128. Regions of interest (BMLs) were defined as well as corresponding bone unaffected by BMLs in the same region. Perfusion was assessed using standard post-processing methods by VirtualScopics. These parameters included: the initial