longer spin lock image has low SNR. This highlights the need for acquisition of spin lock times that cover the full range of the decay curve for the range of T1ρ relaxation times expected. Robust curve fitting methods may help to minimize the effect of low-quality images arising from long spin lock times with short T1ρ tissues. The results shown here quantify the increase in measurement error as SNR and number of spin lock times decrease. This information will help guide design of efficient and robust protocols for quantitative T1ρ imaging in vivo.

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SUPERIORITY OF KNEE ULTRASOUND OVER RADIOGRAPHS IN OSTEOPHYTE DETECTION IN KNEE OSTEOARTHRITIS

S. Slimani [†], A. Haddouche [‡], I. Bencharif [§], A. Ladjouze-Rezig [‖]. [†] *Hadj Lakhdar Univ., Batna, Algeria;* [‡] *Blida Univ., Blida, Algeria;* [§] *Constantine Univ., Constantine, Algeria;* [‖] *Algiers Univ., Algiers, Algeria*

Purpose: Osteophytes are important signs in knee osteoarthritis as they are one of the diagnostic criteria and in the assessment of the disease severity (Kellgren-Lawrence grading). Musculoskeletal ultrasound (MSUS) is being adopted by a growing number of rheumatologists because of its cost-effectiveness and the absence of radiation exposure. The aim of the study was to evaluate the concordance of radiographs and MSUS in terms of detecting osteophytes in knee osteoarthritis.

Methods: A cross-sectional study in outpatients presenting with knee osteoarthritis, according to the 1990 ACR criteria for knee osteoarthritis. Radiographs of the knees (anteroposterior incidence) and MSUS of the knee have been performed for each patient. Two rheumatologists trained in MSUS (S.S and A.H) have done MSUS examinations, and had no access to patients' radiographs. Radiographs were sent and read by an independent rheumatologist (B.I) in another rheumatology center. Osteophytes were searched on 4 sites, chosen because of their easy access by both radiographs and MSUS: medial and lateral femoral condyles; medial and lateral superior tibial extremities. Osteophytes of the femoropatellar compartment have not been assessed because they require strict lateral radiographs and are not easily accessible on MSUS, thus a concordance assessment could not be reliable on this site. Concordance has been assessed using Kappa concordance coefficient.

Results: We have examined 192 knees of 102 patients, 76.5% females, mean age 65.2 ± 9.7 years. Radiographic analysis allowed the detection of osteophytes in 35.9% cases, with a mean number of 1.6 osteophyte per knee, while MSUS detected osteophytes in 86.5% cases, with a mean number of 2.7 osteophyte per knee. The Kappa coefficient between radiographs and MSUS was 0.183 (95% CI: 0,138-0,228). Most of the detected osteophytes on MSUS (60.5%) were located on the femoral condyles.

Conclusions: Concordance between radiography and MSUS in the detection of osteophytes is poor, due to a much higher level of detection of MSUS (2.5 more osteophytes detected with MSUS). This was made possible since new high resolutions machines were made available. The place of knee MSUS is still to be defined in the diagnostic procedure of knee pain, may be in case of normality of radiographs. To do this, studies assessing sensitivity/specificity of knee MSUS in detecting infra-radiographic knee osteoarthritis are required.

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LONG TERM PATIENT REPOSITIONING REPRODUCIBILITY OF CARTILAGE VOLUME ON KNEE MRI

R. Russell [†], C. Ratzlaff [†], M. Hakky [‡], J. Duryea [†]. [†] *Brigham and Women's Hosp., Boston, MA, USA;* [‡] *Lahey Clinic, Burlington, MA, USA*

Purpose: Quantitative measurement of cartilage volume in MRI image data may be an important imaging biomarker in knee osteoarthritis (OA) but relies on reproducible patient re-positioning and image acquisition across time points. We previously developed a fast and responsive method to measure cartilage volume at focal regions in the femur. Figure 1 shows an example of this region in the medial compartment. The purpose of the current study was to examine long-term patient repositioning reproducibility of this method, and to investigate systematic changes in cartilage volume in subjects without OA or risk factors for OA.

Methods: The dominant knee image of 42 randomly selected subjects from the OAI Control Cohort was selected from patients present at the baseline, 12 month and 48 months visits. Since duplicate scans obtained the same day were not available, we used Control Cohort subjects and assumed no change in cartilage volume due to OA progression.

Change in cartilage volume

Visit time	Medial Volume		Lateral Volume	
	RMSSD	CV	RMSSD	CV
BL-12 mo	14.4 mm^3	9.6%	15.3 mm^3	8.8%
BL-48 mo	13.9 mm^3	9.2%	17.5 mm^3	10.2%

Change in normalized cartilage volume

Visit time	Normalized medial volume		Normalized lateral volume	
	RMSSD	CV	RMSSD	CV
BL-12 mo	8.0 mm^3	5.2%	9.7 mm^3	5.6%
BL-48 mo	7.8 mm^3	5.0%	11.7 mm^3	6.8%

Double echo steady state (DESS) 3D sagittal images were obtained on a 3T Siemens Trio MR system (0.365 mm x 0.365mm, 0.7 mm slice thickness, TR 16.5 ms, TE 4.7 ms). The reader used the method to segment two fixed regions of cartilage in the medial and lateral compartments of the knee determined with respect to a 3D cylindrical coordinate system defined by the software. Readings were performed fully blinded to subject ID and time point. Cartilage volume at fixed locations in the medial and lateral compartments was measured between two time point pairs: baseline (BL) to 12 month, and BL to 48 months. A second metric, reflecting cartilage thickness, was defined as the cartilage volume normalized to a measure of the region surface area. Reproducibility was measured using the root mean square SD (RMSSD) and coefficient of variation (CV). To investigate possible biases or any consistent change over time, Bland Altman plots were also produced.

Results: Results from the raw volume measurements are shown in Table 1 and for normalized volume measurement in Table 2. The reproducibility was substantially better for the normalized compared to the raw volume measurements. Bland Altman plots of the normalized volume revealed no systematic bias in the normalized volumes (Figures 2-5) or in raw volume (data not shown).

Conclusions: We observe excellent long-term reproducibility using a normalized volume measurement. The reproducibility is degraded when using the raw volume suggesting a bias from the cartilage region selection component of the method. The Bland Altman plots reveal no systematic shift, indicating a robust method and that no true cartilage volume change occurred.

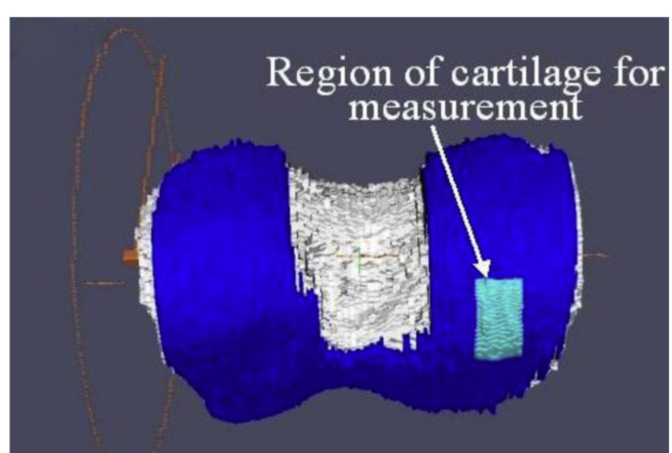

Fig. 1. Region of cartilage for measurement.