# Assessment of interscanner and intravendor variability of T2 relaxation times of cartilage in human tibia at 1.5T and 3T.

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**Purpose:** T2 relaxation time was found to be associated with water content and collagen fiber alignment of cartilage, thus representing a possible quantitative technique for early diagnosis and monitoring of cartilage lesions (1, 2). For evaluation of cartilage change and depiction of treatment effects longitudinal MR measurements over the time course are required. For studies it is often difficult to collect proper sample sizes from a single institution, leading to the suggestion to use MRI data from multiple centers to accomplish larger sample sizes. Consequently it is mandatory to know the magnitude of variability in data acquired in different MR scanners. For this purpose the influence of scanner and magnetic field strength (1.5T and 3T) on global and regional T2 relaxation time of tibial cartilage were evaluated.

**Materials and Methods:** Eight healthy volunteers were examined in 3 different 1.5T scanners and one 3T scanner of the same manufacturer using a coronal 3D-T1-w-FLASH sequence with selective water excitation and a fat-saturated multislice-multiecho-sequence (MSME). Semiautomatic segmentation of tibial cartilage was performed in the FLASH-sequence. All sequence parameters were kept constant within one field strength and the 3 1.5T scanners all had comparable gradient strength. Averaged cartilage T2 for each MRI-slice (global T2) and for subregions (regional T2) defined in cartilage (8 ROIs/slice) was calculated. Variability of global and regional T2 was calculated as root mean square average of the individual coefficients of variation (COV) and as standard deviation (SD). The difference among 1.5T and between 1.5T and 3T were evaluated.

**Results:** Considering all scanners, relative variability was 17.4/21.6% for global T2 and 21%/28.4% for regional T2, absolute variability was 5.1ms/6ms (global T2) and 6.2ms/7.7ms (regional T2). Comparing the 1.5T scanners only, variability was 7.6%/8.2% globally and 13.4%/15.5% regionally, 2.3ms/2.5ms globally and 4.0ms/4.7ms regionally. T2 values at 3T were significantly (P<0.005) lower than at 1.5T.

**Conclusion:** Inter-scanner variability of cartilage T2 at 1.5T is in the order of magnitude of reported test-retest T2 precision errors and thus a significant contributor to overall data scattering in potential studies of cartilage T2 in OA. T2 variability between 1.5T and 3T scanner were markedly larger as expected due to the field strength effect on T2 relaxation time. Therefore, ideally, only one scanner type should be used in studies of cartilage T2 in OA.

**Literature**

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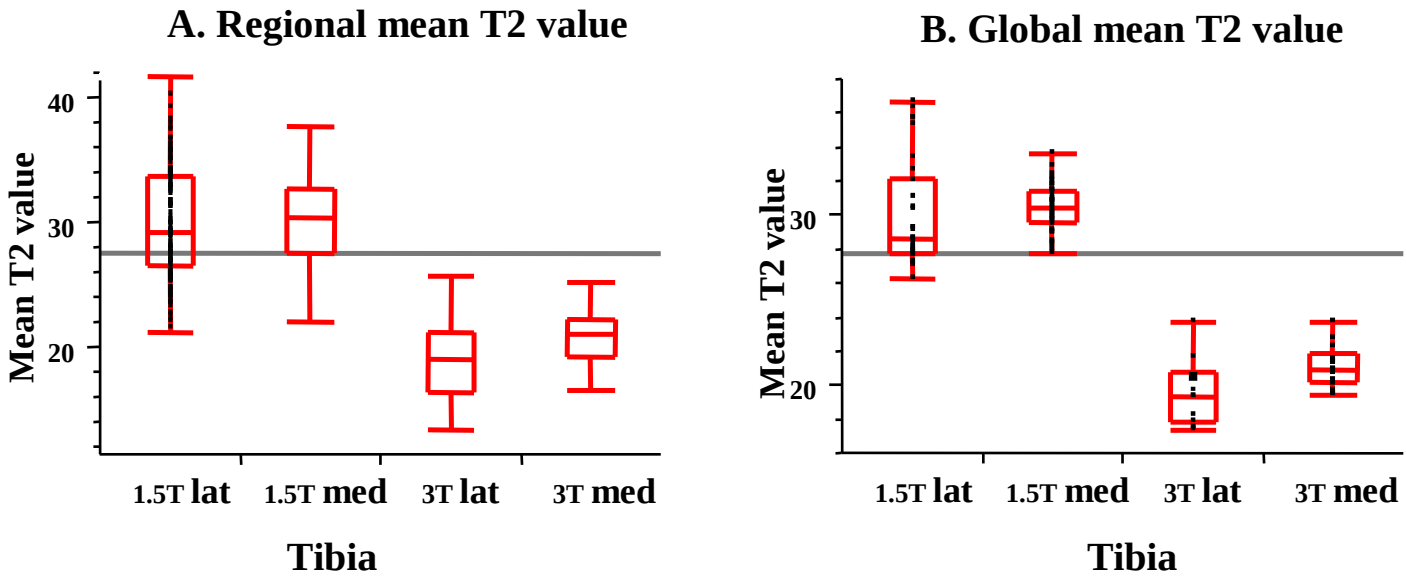


**Figure:**
A - regional mean T2 value. B - global mean T2 value. Both regional and global average T2 values were significantly lower for 3T (P<0.0001).