

## Vertebral fat deposition with normal aging: Quantitative analysis with IDEAL IQ at 3T

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### Purpose

IDEAL IQ is a novel MR technique that generates estimated volumetric maps of both T2\* and triglyceride fat fraction in a single breath-hold noninvasively. Our purpose was to assess the fat fraction and T2\* values of the vertebrae in healthy subjects with IDEAL IQ.

### Materials and Methods

105 patients who underwent MR study including IDEAL IQ were retrospectively evaluated. The patients with the following diseases were excluded from further study: malignant tumors, lympho-proliferative diseases, severe anemia, severe liver or renal dysfunction, metabolic diseases, and autoimmune diseases. Consequently, 75 patients (28 males, 47 females, age range 15 - 88 years, mean 49.5 years) were included. We divided the patients into 4 groups for evaluation of fat fraction (FF) and R2\* values; Group 1: 22 women younger than 50 years old, Group 2: 25 women older than 50, Group 3: 13 men younger than 50, and Group 4: 15 men older than 50. The parameters for IDEAL IQ were as follows: TR/TE/FA=6.3/2.4/12, acquisition time 22 sec, matrix 320x192, FOV 28x28cm, slice thickness 4mm, NEX 1. Using quantitative IDEAL, the mean FF and the mean R2\* values within the lumbar and sacral spine (L1-L5, S1) were evaluated at each subjects. To evaluate the level of interobserver agreement, the independently-assigned scores were subjected to the Kendall W-test. Analysis of covariance (Ancova) was performed to investigate gender and age group differences in FF quantification. The independent variables were the gender and age groups. We also analyzed the relationship between FF and body mass index (BMI); BMI was divided into three groups (<19, 19-25, 25-).

### Results

The percentage of fat fraction increased with advancing age (Fig. 1). There was no significant sex-related difference of FF for over 50 (between Group 2 and Group 4) (Fig 2). In contrast, young males (Group 3) showed higher FF than young females (Group 1). The low BMI group (BMI<19) showed significantly lower FF than the other groups (BMI 19-25 and 25-). R2\* value was not correlated with age, gender, nor BMI.

### Discussion

The FF is probably influenced by the bone marrow cellularity, which can change dramatically upon aging and various pathologic processes. We observed that FF on IDEAL IQ was correlated with age, gender and BMI; our data of the vertebral fat deposition with IDEAL IQ might add useful information for the diagnosis of various vertebral pathologies. Since there was no significant sex-related difference of FF for over 50, however, FF might not be useful for the diagnosis of osteoporosis; further evaluation in the patients with osteoporosis is necessary.

### Conclusion:

The quantitative analysis of the vertebral fat depositions with IDEAL IQ seems feasible and can demonstrate the age-, gender- and BMI-related changes.

Fig. 1 Correlation between FF and age

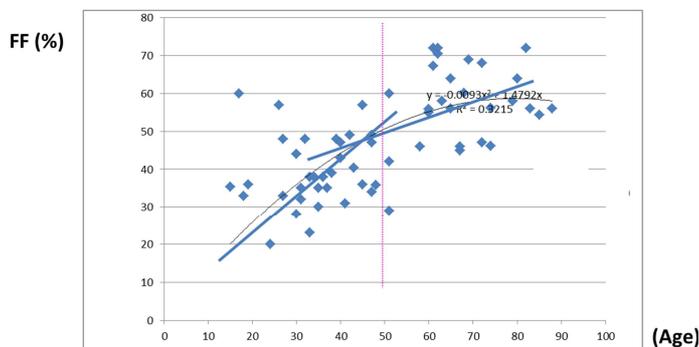


Fig. 2 Correlation of FF with age and gender

