Normal range and Reproducibility of multi-frequency MR Rheology of healthy liver at 3.0T MRI

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Target Audience: Radiologists who are interested in MR Rheology for the evaluation of liver disease

Purpose: We tried to assess the normal value of shear modulus (Gd), loss modulus (Gl) and complex modulus (G*) of the healthy liver, and evaluate their reproducibility at 3.0T MRI.

Materials and Methods: Sixty healthy volunteers (Age, 37.8 ± 12.5 year; male:female, 44:16) without any liver disease were prospectively enrolled. Multi-frequency MR rheology (MRR) was acquired with a transducer frequency of 28Hz, 56Hz and 84Hz in all applicants, twice with interval, at 3.0 T MR (Achieva, Philips Medical System, Best, The Netherlands). MRR parameters were as follows: 3D gradient-echo FFE sequence (TR/TE, 76ms/6.9ms; slice thickness, 4mm; slice number, 8; flip angle, 15°; matrix, 80*53). Gd, Gl and G* were calculated from central 4 slices, central 2 slices and the upper most 1 slice. The mean values of modulus between two measurements were compared with paired t test. Reproducibility of three modulus was evaluated using intraclass correlation coefficient (ICC) and Bland-Altman plot for each frequency.

Results: The mean normal values which were calculated from central 4 slices were 1.00㎪, 1.93㎪, 3.05㎪ for Gd, 0.58㎪, 0.94㎪, 1.83㎪ for Gl and 1.19㎪, 2.20㎪, 3.66㎪ for G* in 28Hz, 56Hz and 84 Hz, respectively. ICC was higher in 28Hz and 56Hz than 84 Hz for all variables. There was a significant difference in mean Gl(P=0.024) and G*(P=0.045) between two measurement. ICC was significantly decreased when only one slice (the uppermost slice) was used for the calculation of Gd, Gl and G*, compared to ICC when modulus were calculated from central 4 or 2 slices.

Conclusion: The reproducibility of MRR was higher at lower transducer frequency and MRR modulus should be calculated from the data which were obtained from at least central 2 slices of MRR.

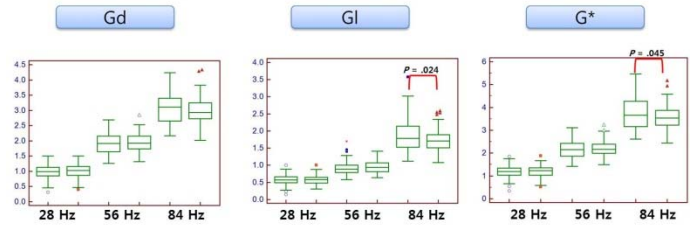

Figure: There was significant difference in Gl (P = 0.024) and G* (P = 0.045) in the transducer frequency of 84 Hz.

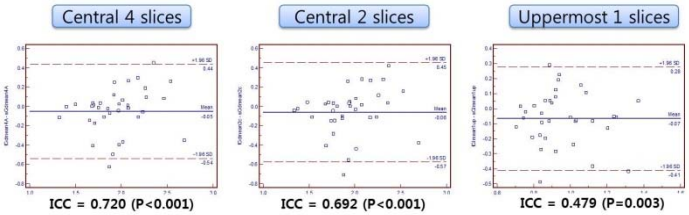

Figure: ICC was the highest value when central 4 slices were used for the calculation of Gd