Whole-body T2* mapping

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Introduction: Whole-body MRI allows for comprehensive tissue examinations especially useful in the detection and follow-up of malignant diseases[1-2]. In this study, we investigated the feasibility of an MRI protocol able to provide high quality T_2^* relaxation maps of the entire body at 1.5T. Clinical applicability of the protocol was tested in one patient suffering from iron overload due to repeated blood transfusion treatments.

Purpose: To investigate the feasibility of a whole-body MRI protocol providing T_2^* parametrical maps of the entire body at 1.5 Tesla.

Material and Methods: Seven healthy volunteers (mean age=30.1±3.7, 3 women and 4 men), and one patient (male, 53 years-old) with diagnosis of myelodysplastic syndrome, participated in the study. Images of five subsequent body levels were acquired using a fat-suppressed multi-echo (12 echo times were selected in the range between 4.8 and 76.3 ms) 2D gradient-echo sequence and afterwards composed. Parametrical T_2^* maps of the whole-body were computed on a pixel-by-pixel basis. Local T_2^* values were evaluated in the cerebral white and gray matter, liver, spleen, kidney, and skeletal muscles.

Results and Discussions: Good quality T_2^* maps of the entire body were obtained without spatial distortions or significant artifacts (**Fig. 1**). In healthy volunteers, the computed T_2^* values amounted to: 58.5±4.2 ms for white matter, 81.4±5.5 ms for gray matter, 63.5±3.3 ms for spleen, 65±10 ms for kidney, 34.3±7.0 ms for liver, and approx. 30 ms for skeletal muscle (e.g. vastus lateralis muscle =30.0±2.8 ms). The patient affected by myelodysplastic syndrome (serum ferritin concentration = 927 μg/dl) showed shortened T_2^* values in liver (3.6±5.5 ms), spleen (3.1±4.8 ms), kidney (11.1±7.1 ms), and muscles (e.g. vastus lateralis muscle =25.1±3.4 ms) (**Table 1**). This study showed the feasibility of high quality T_2^* whole-body mapping at 1.5 T. Preliminary results suggest that whole-body T2* mapping may be used for the assessment of iron load in the entire body. This new modality may become a helpful tool for the comprehensive monitoring of iron balance in the body in patients treated with repeated blood transfusion.

References: [1]Schlemmer HP, et al. Invest Radiol 2005; 40: 64-71; [2]Boss A, et al. J Magn Reson Imaging 2006; 24: 1183-1187.

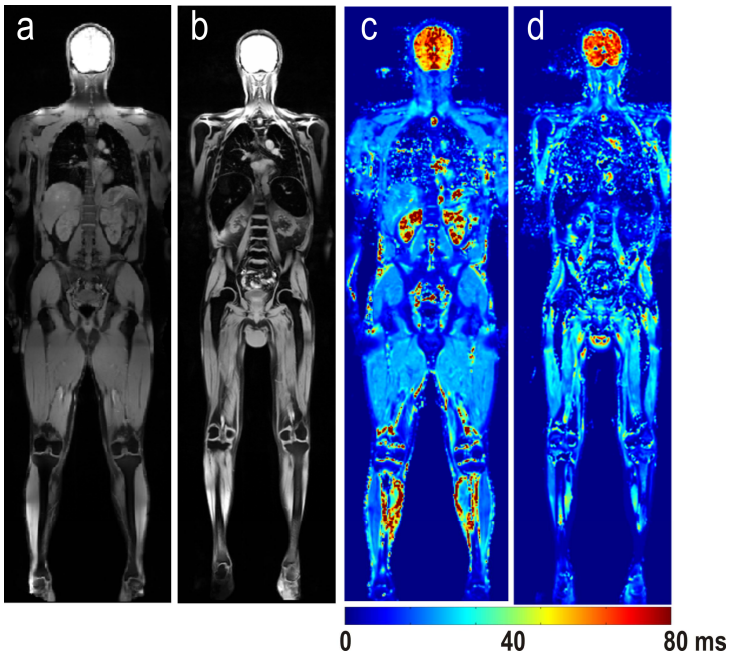

Table 1 Local T2* values (in units of ms) computed in the healthy group of volunteers and in the patient.

	Healthy volunteers	Patient
White matter	58.5 ± 4.2	58.3 ± 6.0
Gray matter	81.4 ± 5.5	85.1 ± 7.2
Liver	34.3 ± 7.0	3.6 ± 5.5
Spleen	63.5 ± 3.3	3.1 ± 4.8
Muscle	30.0 ± 2.8	25.1 ± 3.4
Kidney	65.4 ± 10.3	11.1 ± 7.1

Fig. 1 The anatomical references (a,b) acquired using a FLASH sequence (TR/TE=200ms/4.8ms, flip angle=40°) are compared with the corresponding T2* maps (c,d). Significant differences in the T2* values computed in the healthy volunteers (a,c) and the patient (b,d) were found in liver, spleen, kidney, and muscles.