# Assessment of renal function and morphology in potential living kidney donors using dynamic contrast-enhanced MRI: initial results

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Introduction: Accurate evaluation of potential living kidney donors is a time-consuming procedure, which aims at identifying eligible donors with normal renal anatomy and function. Traditional protocols for the screening of potential living kidney donors include radionuclide-based determination of the glomerular filtration rate (GFR) and split renal function, ultrasound examination of kidneys and abdomen, and renal arteriogram[1].

Purpose: In this study we tested the feasibility of a single MR-based examination allowing for the comprehensive assessment of renal anatomy, function, and vascular status in potential kidney donors.

Materials and Methods: Twelve healthy potential kidney donors (mean age 47±14 years) participated in the study, which was approved by the local institutional review board. MR-nephrography was performed using a navigator-gated T1-weighted saturation-recovery sequence (TrueFISP: TR/TE=404.8ms/1.27ms, Flip angle=70°, TI=300ms, BW=977Hz/Px, or TurboFLASH: TR/TE=528ms/1.15ms, Flip angle=8°, TI=300ms, BW=600Hz/Px). Images were acquired up to 60 minutes after the injection of 4ml of gadobutrol. The GFR was evaluated from the renal clearance of gadobutrol within the extra-cellular fluid volume by exponential fitting of time-signal curves measured over the liver[2] (**Fig. 1a**). MR-angiography was performed using a T1-weighted 3D-FLASH sequence. For each subject, GFR data assessed with dynamic MR-nephrography were compared to the results of the renal scintigraphy with $^{99m}$Tc-labeled DTPA from the same day.

Results and Discussions: Renal anatomy and vascular status were successfully assessed in all subjects (**Fig. 1b,c**). MR-nephrography and renal scintigraphy presented a good agreement (mean GFR from MR-nephrography=117±24ml/min per 1.73m$^2$; mean GFR from scintigraphy=116±26ml/min per 1.73m$^2$). The Bland-Altman-plot showed a mean difference in measurements pairs of -1±12ml/min per 1.73m$^2$; whereas the absolute paired difference ranged between 0 and 22 ml/min per 1.73m$^2$.

The study proved the feasibility of a comprehensive assessment of renal anatomy, function and vascular morphology using a single MR examination. The proposed protocol represents an alternative to three diagnostic modalities (i.e. renal scintigraphy, ultrasound, and renal arteriogram), and results in reduced examination time and health care costs.

References: [1]EBPG Expert Group on Renal Transplantation. Nephrol Dial Transplant 2000; 15 (Suppl. 7): 39-51;[2]Boss A. et al. Radiology 2007; 242:783-790.

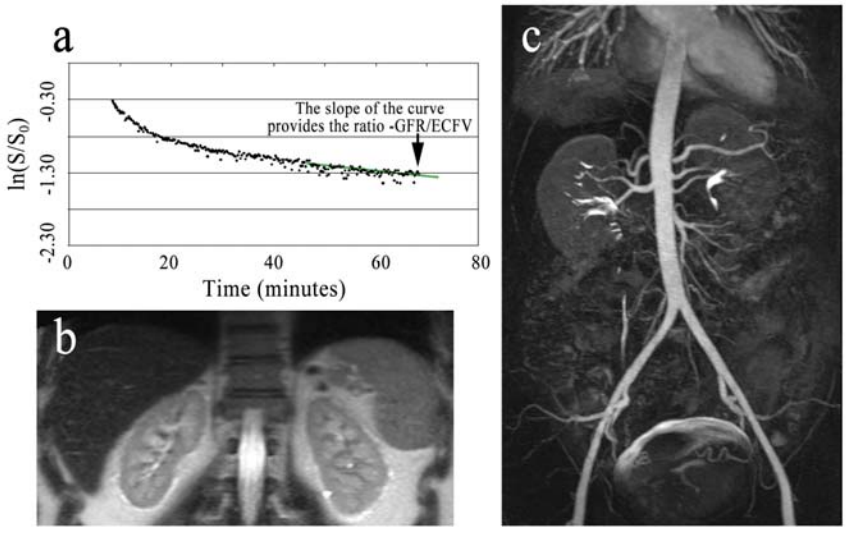


**Fig. 1** The typical pattern of the signal attenuation after injection of the contrast medium as a function of the acquisition time is reported in a. The signal was measured in T1-weighted images on the liver. After the mixing of the contrast medium into the extra cellular fluid volume (ECFV), the contrast medium is excreted through glomerular filtration. The linear fit of the second phase of the signal decay provides the ratio –GFR/ECFV. The T2-weighted image (b) and the MR-angiography (c) of two potential kidney donors are shown as well.