AbstractID: 12713 Title: Accelerating Non-Contrast-Enhanced MRA with Inflow Inversion Recovery by using Skipped Phase Encoding and Edge Deghosting (SPEED)

Purpose: Non-contrast-enhanced MR angigraphy (MRA) has always been a valuable clinical tool to study vasculatural diseases. The recently arising concerns of constrast agents in contrast-enhanced MRA encouraged more use of non-contrast-enhanced MRA. The aim of this work is to accelerate non-contrast-enhanced MRA with inflow inversion recovery (IFIR) with a fast imaging method, Skipped Phase Encoding and Edge Deghosting (SPEED)

Method and Materials: IFIR imaging uses a preparatory inversion pulse to reduce signals from static tissue, while leaving inflow arterial blood unaffected, resulting in sparse arterial vasculature on modest tissue background. By taking advantage of vascular sparsity, SPEED can be simplified with a single-layer-model to achieve higher efficiency in both scan time reduction and image reconstruction. SPEED can also make use of information available in multiple coils for further acceleration. The techniques are demonstrated with a 3D renal non-contrast-enhanced IFIR MRA study performed on a 3.0 T scanner (GE Healthcare,WI) with a Respiratory Triggered IR-Prepared Fiesta (SSFP) sequence (matrix 256x256, FOV 36cm, TI 200ms, TR 4.2ms, TE 2.1ms, slice thickness 2mm, space between slices 1mm, flip angle 70^{o}, single acquisition, slices 116).

Results: Images are reconstructed by SPEED based on a single-layer model to achieve an undersampling factor of up to 4.2 using one skipped phase encoding direction. By making use of information available in multiple coils, SPEED can achieve an undersampling factor of up to 8.3 with four receiver coils. The reconstructed images generally have comparable quality as that of the reference images reconstructed from full k-space data.

Conclusion: This study demonstrated the successful application of SPEED to accelerate non-contrast-enhanced IFIR MRA based on a single-layer-model. Although the single-layer-model SPEED is demonstrated with only renal IFIR MRA, it may have great potential in other MRI applications, particularly in cases where sparse signals are distributed on a modest tissue background.