

[Previous Abstract](#)**825 W-AM****Comparison of SENSE and GRAPPA Reconstruction for Proton-Echo-Planar-Spectroscopy Imaging (PEPSI)**Shang-Yueh Tsai^{1,2}, Arvind Caprihan^{3,4}, Stefan Posse^{3,5}, Fa-Hsuan Lin¹

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Objective: Partial parallel acquisitions have been demonstrated to reduce imaging time with encoding steps partially replaced by spatial information contained in the phase array coils [1]. These techniques can be beneficial for spectroscopy imaging (SI) to reduce long scanning times associated with phase encoding [3]. Proton Echo Planar Spectroscopic Imaging (PEPSI) [4] is intrinsically much faster due to the use of interleaved spatial-spectral encoding, but PEPSI with spatial encoding and phase cycling will benefit from the combination with parallel imaging. This study, in vivo results using the combination of parallel techniques and short TE PEPSI are reported.

Methods: PEPSI was performed on healthy volunteers using 1.5T Siemens Sonata and 3T Siemens Trio scanners with 8-channel surface array coils. PEPSI data were acquired from a para-axial slice along the upper edge of the ventricles with experiment parameters: TR/TE = 2s/12-30ms, matrix size 32x32/64x64, minimum pixel size: 5mm. Complete 8-slice outer volume suppression was achieved along the perimeter of the brain. Even- and odd-echo data were reconstructed separately using a non-water suppressed reference scan for automatic phasing and frequency shift correction [2]. To simulate partial parallel imaging, standard SENSE and GRAPPA reconstruction algorithms were implemented by decimating k-space data along the phase encoding direction at acceleration factor (R) of 2.0 and 4.0. For SENSE, coil sensitivity maps were estimated by the non-water suppressed data for individual coil separately. For GRAPPA, 20 auto-calibration signals (ACS) were acquired to estimate weighting factors on non-water-suppressed and water-suppressed data separately.

Results & Discussion: The reconstructed spectroscopic images of SENSE and GRAPPA were shown in Fig.1. Both SENSE and GRAPPA reconstructed spectra were similar to the fully sampled spectrum with decreased SNR due to reduced phase encoding. (Fig 2). The reconstruction performance is worse in the water-suppressed images compared to non-water-suppressed images. This is more apparent in the SENSE reconstructions (Fig.1). At R = 4, both SENSE and GRAPPA reconstructions are unstable due to reduced data samples.

Conclusions: In this study the combination of parallel imaging techniques, GRAPPA and SENSE with PEPSI is shown to be feasible for a 2-fold reduction of SI scanning time. SENSE can provide a better reconstruction when high-quality estimates of sensitivity maps are available, which is the case for non-water-suppressed spectroscopic images. On the other hand, GRAPPA does not require explicit estimation of coil sensitivity maps in image reconstruction. GRAPPA may thus achieve improved reconstruction for data with lower SNR, such as water-suppressed spectroscopic images. In the future, we will further investigate the spectral quality and localization performance of parallel imaging with 3D spatial encoding using GRAPPA and SENSE acceleration in 2 spatial dimensions.

References & Acknowledgements: This work was supported by NIDA 1 R01 DA14178-01, R01 HD040712, R01 NS037462, P41 RR14075, and the MIND Institute - Mental Illness and Neuroscience Discovery DOE Grant No. DE-FG02-99ER62764.

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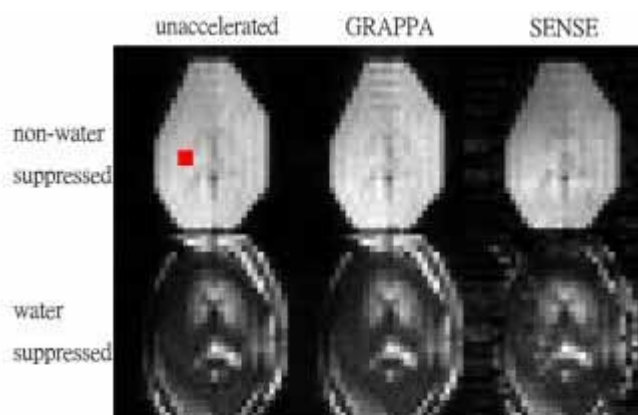


Fig.1 Spectroscopic images of the integrated non-water-suppressed spectra (Top) and the integrated water-suppressed spectra (Bottom) at R=2.

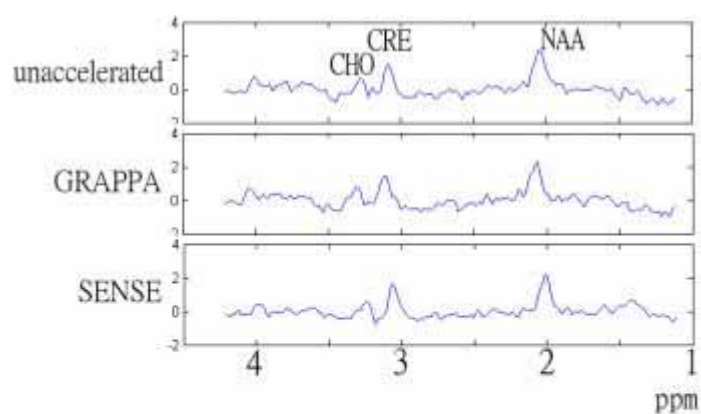


Fig.2 Localized spectra from the voxel marked in red in Fig.1 with metabolite peaks from choline (Cho), creatine (Cr) and N-acetyl-aspartate (NAA).