AbstractID: 5092 Title: MR image quality testing of k-space- and image-based parallel imaging techniques using the ACR phantom

Purpose: Using ACR MRI phantom testing to evaluate the change of image quality caused by k-space- and image-based parallel imaging techniques in a 3-Tesla MRI scanner.

Method and Materials: All phantom images are acquired from a 3 Tesla Siemens Tim-Trio MRI scanner. Four sequences, namely ACR T1, ACR T2, Site T1 (IR-TSE, TR/TE/TI=2200 ms/11 ms/900 ms, ETL=5) and Site T2 (TSE, TR/TE=4280 ms/88 ms, ETL=15) , are scanned with each of the conventional, GRAPPA (iPAT=2) and modified SENSE (mSENSE, iPAT=2) modes. Images are analyzed according to standard ACR MRI QC procedures on a PC-based workstation.

Results: The results derived from the phantom images indicating that both of the tested parallel imaging techniques make no significant changes in the degree of the geometric distortion, the high contrast spatial resolution, the measured slice thickness and position accuracy, and the percent image uniformity. The signal-to-noise ratios (SNRs) obtained from all scans are lower while using parallel imaging techniques (SNR_conventional / SNR_GRAPPA = 1.18 +/- 0.08, SNR_conventional / SNR_mSENSE = 1.11 +/- 0.19). The averaged scores of low contrast object detecting test in conventional, GRAPPA, and mSENSE group are 39.3 +/- 0.5, 35.0 +/- 4.4, and 34.3 +/- 3.9, respectively. The percent signal ghosting (PSG) of GRAPPA and mSENSE images are 1.57 +/- 0.72 and 2.26 +/- 1.47 times of that measured in the conventional images. In addition, there is an obvious aliasing artifact observed in the mSENSE groups that cannot be demonstrated by the above data analysis.

Conclusion: The ACR QC test is able to detect the lower SNR, lower contrast detectability, and higher PSG caused by both k-space- and image-based parallel imaging techniques. More accurate measurement of SNR reduction and improved artifact detection require repeated phantom imaging and additional image analysis.