Initial Experience with Cardiac Imaging using a Short, Wide Bore 1.5T System

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INTRODUCTION

We present our initial experience with cardiac MR on a short, wide bore system. The wide bore 1.5T MR system provides a new capability for imaging large and claustrophobic patients but also presents unique challenges for cardiac MR due to a reduction in FOV in the z-direction. The image quality, imaging speed, and FOV are characterized for the short, wide bore system as compared to the standard bore 1.5T systems.

METHODS

A cardiac MR protocol consisting of localization (trueFISP), cine function (trueFISP), 1st pass perfusion (GRE-EPI or TurboFLASH), and delayed enhancement (turboFLASH) was used to image patients weighing up to 404 lbs using the Siemens Magnetom Espree 1.5T system (70 cm bore, 125 mm length, 35 mT/m, SR 100T/m/s) (Fig.1). More than 200 patients have been scanned to date (14 patients > 300 lbs). Parallel imaging (rate=2) was utilized for localization and cine (GRAPPA), as well as perfusion (TSENSE). Siemens product spine and body array coils (12 elements) were used.

The reduction in imaging speed due to reduced gradient performance of the wide bore system was measured for each protocol and compared with equivalent protocols on the Avanto with higher gradient performance (45 mT/m, SR 200 T/m/s). The z-FOV was measured using the sagittal localizer as the region clear of banding artifacts since the trueFISP sequence is highly sensitive to off-resonance caused by field inhomogeneity. Myocardial SNR was measured for cine images, and artifacts due to off-resonance effects were noted.

RESULTS

Protocols optimized to achieve equivalent spatial and temporal resolution to standard bore systems with high performance gradients had reduced speed: 9 vs 8 heartbeats breath-hold duration for retro-cine (256x160, temporal resolution=43 ms), 125 vs 111 ms/slice including SR prep (75 vs 61 ms imaging duration) for GRE-EPI perfusion (128x80), 8.7 vs 8.4 ms TR for delayed enhancement. The temporal resolution of the most demanding highly accelerated (rate=4) real-time, trueFISP sequence used for patients with arrhythmia was increased, 53 vs 42 ms (128x72). Protocols and performance specifications are listed in Tables 1-4.

CONCLUSIONS

Cardiac MR imaging with the short, wide bore 1.5T system is feasible and it was possible to image subjects that were previously too large for standard bore systems (up to 404 lbs to date). Temporal resolution equivalent to that achieved with higher-performance gradients was possible within reasonable breath-hold durations. Artifacts due to field inhomogeneity were generally outside the heart region. All studies were diagnostic quality.