

Poster presentation

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A single breath-hold for analysis of systolic and diastolic cardiac function: TGRAPPA accelerated multiplanar Cine MR imaging at 3 Tesla

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Introduction

CMR is the standard of reference in cardiac functional analysis. However, long data acquisition time which necessitates repeated breath-holding results in extended overall examination time. Furthermore post-processing of standard short axis cine data for evaluation of systolic and diastolic function is rather time-consuming.

Purpose

The aim of this study was to evaluate the accuracy of a recently introduced TGRAPPA accelerated single-breath-hold multi-planar cine approach for analysis of systolic and diastolic left ventricular function at 3 T.

Methods

23 patients underwent cine MRI at 3 Tesla (Magnetom Verio) using a 32-element cardiac coil for signal reception. In all patients a stack of short axis slices was acquired using a standard non-accelerated cine SSFP technique (STANDARD) with 8 mm slice thickness and a 2 mm interslice gap. In addition a multi-planar cine SSFP data set based on three short axis slices, a vertical and a horizontal long axis slice was acquired within a single-breath-hold using a 4-fold accelerated cine SSFP technique (TGRAPPA). 4D analysis of the multi-planar data sets was performed using a commercially available algorithm (syngo ARGUS 4D) with long axis definition of the AV valvular planes. 4D data was compared with the standard single-slice technique (syngo ARGUS) according to the

Simpsons' rule for end-diastolic volume (EDV), end-systolic volume (ESV), ejection fraction (EF), myocardial mass (MM), peak filling rate (PFR) and peak ejection rate (PER). All data were evaluated by two independent readers. In addition time intervals necessary for data acquisition as well as for data post-processing were recorded.

Results

The TGRAPPA approach did not exhibit any significant differences to the STANDARD approach for EF (61.7 ± 12.5 vs. $64.1 \pm 10.5\%$; $P = .12$), EDV (123.8 ± 40.5 vs. 129.9 ± 48.3 ml; $P = .12$), ESV (50.0 ± 34.1 vs. 49.4 ± 32.2 ml; $P = .83$) and MM (126.7 ± 34.9 vs. 121.5 ± 37.2 g; $P = .03$). Diastolic evaluation using the 4D technique though revealed significant differences for PER (564.8 ± 204.1 vs. 366.8 ± 82.0 ; $P = .001$) and PFR (535.6 ± 244.6 vs. 269.9 ± 108.4 ; $P = .03$). The coefficient of variation was 10.49 for 4D EF and 3.98 for STD EF analysis showing a significant higher variation of parameters for the multi-slice approach. Time-efforts for acquisition (273.5 ± 124.5 vs. 12.4 ± 3.1 sec) and post-processing (15.2 ± 5.4 vs. 5.7 ± 2.3 min) were significantly shorter for the TGRAPPA 4D cine ($P < 0.001$).

Conclusion

Multi-planar single breath-hold cine acquisition at 3 Tesla facilitates significantly shorter analysis of ventricular function. This approach may substantially speed up workflow for assessment of cardiac function at 3 T. Diastolic param-

eters especially may show off-sets to standard techniques based on model differences.

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