

Poster presentation

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Cardiac Cine MR imaging: Fast high-resolution ventricular coverage using TGRAPPA cine SSFP for assessment of systolic and diastolic LV function at 3 Tesla

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Introduction

Cine SSFP imaging represents the standard of reference in assessment of cardiac function at 1.5 and 3 T but is typically associated with an overall examination time of 6-9 min based on a single-slice approach. Real-time techniques allow for a substantial reduction in acquisition time but may also be accompanied with restrictions in spatial and/or temporal resolution. Modern parallel imaging allow for a substantial speed-up in data sampling without necessarily affecting parameters of spatial/temporal resolution.

Purpose

To implement and evaluate the accuracy of a multi-slice dual-breath hold cine MR technique with high spatial and temporal resolution for analysis of global systolic and diastolic left ventricular (LV) function at 3 T.

Materials and methods

24 patients referred to cardiac MR underwent cine imaging at 3 T (MAGNETOM Verio) using prospective triggered SSFP (TR 3.1 ms; TE 1.4 ms; FA 60°) and a 32-element cardiac coil for signal reception. Analysis of LV function was performed using a standard non-accelerated single-slice approach (STANDARD) with multiple breath-holds and an accelerated multi-slice technique (TGRAPPA; $R = 4$) encompassing the ventricles with 5 slices/breath-hold. Parameters of spatial and temporal resolution were kept identical (pixel: $1.9 \times 2.5 \text{ mm}^2$; tem-

poral resolution: 47 ms). Data of both acquisition techniques were analyzed by two readers using semiautomated algorithms (syngoARGUS) in respect to end-diastolic volume (EDV), end-systolic volume (ESV), ejection fraction (EF), myocardial mass (MM), peak filling rate (PFR) and peak ejection rate (PER) including the assessment of the interobserver agreement. Time efforts for data acquisition and post-processing were also recorded.

Results

Volumetric results of the TGRAPPA approach did not show significant differences to the STANDARD approach for EF ($63.9 \pm 9.5\%$ vs. $63.3 \pm 9.1\%$; $P = 0.8$), ESV ($50.0 \pm$

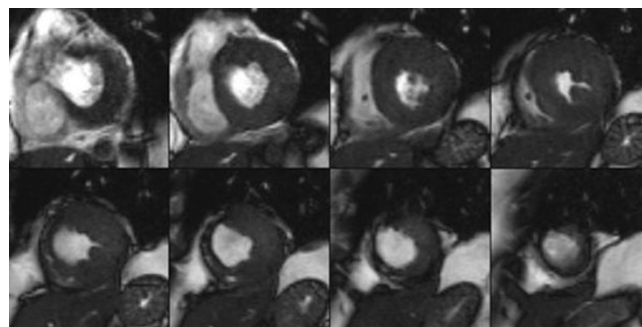


Figure 1

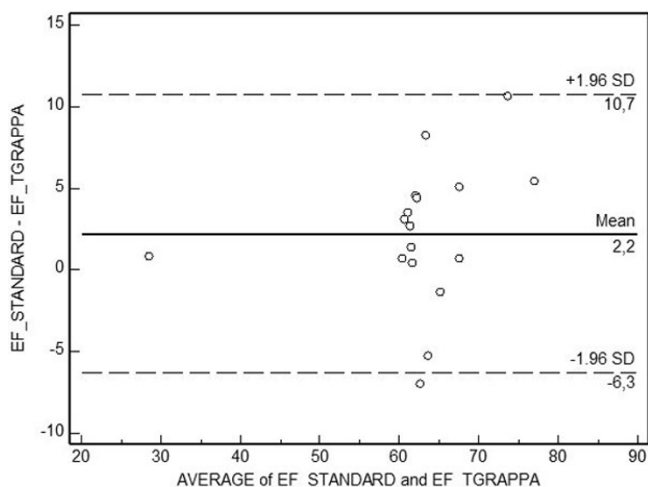


Figure 2

34.1 ml vs. 49.7 ± 32.1 ml; $P = 0.3$), EDV (129.4 ± 45.7 ml vs. 130.6 ± 48.3 ml; $P = 0.5$), MM (107 ± 33.8 g vs. 114.6 ± 33.1 ml; $P = 0.08$), PER (538.0 ± 184.4 ml/s vs. 541.9 ± 190.0 ml/s; $P = 0.3$) and PFR (426.7 ± 216.7 ml/s vs. 430.1 ± 217.7 ml/s; $P = 0.8$). Limits in interobserver agreement were low for systolic ($P = 0.05$) and high for diastolic parameters in both groups ($P = 0.001$). Total acquisition time for the STANDARD technique was 273 ± 124 sec and 34 ± 5 sec for TGRAPPA ($P = 0.001$). Necessary post-processing efforts for the TGRAPPA multi-slice approach did not show significant differences to the STANDARD single-slice approach (9.8 ± 2.1 vs. 10.8 ± 1.4 min; $P = 0.08$) Figures 1, 2 and 3.

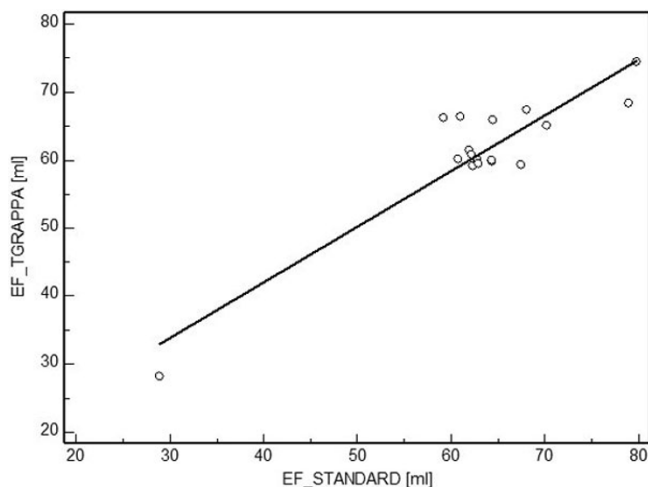


Figure 3

Conclusion

Fast multislice dual-breath hold CINE MR imaging at 3 T using TGRAPPA acceleration enables an accurate and reproducible evaluation of global systolic and diastolic left ventricular function at 3 T while substantially reducing data acquisition time.

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