

Meeting abstract

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I 122 Regional differences in signal gain in cardiac mri at 3.0 tesla. An intra individual comparison of different sequences

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Purpose

To compare signal-to-noise-ratio (SNR) and contrast-to-noise-ratio (CNR) of different regions of the left ventricle using SSFP- and FSE-black-blood-imaging techniques at 1.5 and 3.0 T on volunteers and to examine signal behaviour in SSFP-imaging depending on the image-plane.

Methods

18 healthy volunteers, mean age 28 (± 5), underwent cardiac mri examination using a GE Signa 1.5 T and a GE Signa 3.0 T system with Excite technology.

Signal reception was performed using a four-channel phased-array-coil of identical coil design for both field strengths. Breath-held ECG triggered 2D-Cine imaging was performed at the midventricular level of the left ventricle using a short-axis-view (SA), a long-axis two chamber view (LA) and a four-chamber-view (4 CV) with "steady-state-free-precession" (SSFP) FIESTA-Sequences. Fast-Spin-Echo-sequences (FSE) in T1-(Double-IR), T2 and T1-Stir (Triple-IR)-weighting were performed at the midventricular level of the left ventricle in the SA-view. For the SA-view SNR and CNR of the whole left ventricle as well as for the four LV-segments: septum (S), anterior-(AW), posterior- (PW) and lateral wall (LW) was calculated. For the LA- and 4CV-view SNR and CNR of the whole left ventricle was calculated.

Results

The SNR and CNR for the whole left ventricle was increased in all FSE- and all SSFP-sequences at 3.0 T (FSE:

SNR min. 8%, max. 25%/CNR: min.11%, max. 25%; FIESTA SNR: max. 129%, min 107%, CNR: max.50%, min. 32%). In all FSE-sequences there were differences in SNR and CNR depending on the heart segment at both field strengths. At 3.0 T the differences were smaller than at 1.5 T. There was also a difference in the increase of SNR and CNR depending on the region of the LV. In the FSE-sequences the highest gain in SNR/CNR was obtained in the AW and LW (SNR: min.17%, max. 39%), the lowest gain in the septum (SNR: min. -1%, max. 9%). At both field strengths the lowest SNR and CNR was found in the PW. At the FIESTA-Sequences there was found a dependence of the signal behaviour on the image plane with the highest SNR and CNR in the SA at both field strengths. In the SA-view differences in signal-behaviour between the LV-segment again were found, with the highest SNR and the highest increase of SNR (129%) in the septum at both field strengths. In contrast to the FSE-Sequences, at the FIESTA-sequences the differences between the LV-segments were smaller at 1.5 T than at 3.0 T.

Conclusion

The mean SNR and CNR was increased at 3.0 T compared to 1.5 T at both, FSE- and FIESTA-Sequences. Regional differences in signal-behaviour exist at both field strengths. The heart segments benefit to a different degree from the higher field strength. At both field strengths the lowest SNR/CNR is to be found in the PW, which is prior to signal inhomogenities. In Cine-Imaging with SSFP these signal inhomogenities are increased at 3.0 T. Due to this the

improvement of the design of cardiac mri sequences at higher field strengths is mandatory.

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