Synthetic Phase Sensitive Inversion Recovery Late Gadolinium Enhancement from Post-contrast T1-mapping Shows Excellent Agreement with Conventional PSIR-LGE for Diagnosing Myocardial Scar

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Background: Cardiac magnetic resonance (CMR) imaging using phase sensitive inversion recovery (PSIR) late gadolinium enhancement (LGE) is the in vivo reference standard for assessing focal myocardial scar. We hypothesized that Synthetic PSIR LGE from post-contrast T1-mapping (SynLGE) has an accuracy that approaches LGE for diagnosing myocardial scar.
Methods: Patients (n=109, mean±SD age 50±16 years, 63% male) underwent CMR at 1.5T (Siemens) with LGE followed by SynLGE of the whole left ventricle (LV). Two blinded observers assessed the presence of myocardial scar.
Results: Consensus identified scar by LGE in 44/109 (40%) patients. The interobserver agreement for LGE prior to consensus was 82/109 (75%). Scar patterns were non-ischemic (n=24), ischemic (n=18) or both (n=3). Compared to LGE, SynLGE yielded a diagnostic sensitivity of 34/44 (77%), specificity of 64/65 (98%), positive predictive value of 34/35 (97%), negative predictive value of 64/74 (86%), and an overall agreement of 98/109 (90%, p=0.002 vs LGE interobserver agreement). Of the cases where SynLGE missed a scar (n=10), these were either non-ischemic scars in <1 segment (n=4), or 1-2 segments (n=3) or infarction in a thin wall (n=3). In one case, SynLGE identified a midmural non-ischemic scar not identified by LGE. See figure.
Conclusions: Overall, SynLGE showed high agreement with LGE. This blinded intermethod agreement exceeded the interobserver agreement for LGE, suggesting clinical utility of SynLGE. Conventional LGE may not be necessary when full LV coverage post-contrast T1-maps with SynLGE are routinely acquired for myocardial extracellular volume assessment. SynLGE therefore has the potential to reduce total scan time, except in challenging cases where complementary LGE can be added.