

Whole left ventricular functional assessment from two minutes free breathing multi-slice CINE acquisitio

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Abstract

Two major challenges in cardiovascular MRI are long scan times due to slow MR acquisition and motion artefacts due to respiratory motion. Recently, a Motion Corrected-Compressed Sensing (MC-CS) technique has been proposed for free breathing 2D dynamic cardiac MRI that addresses these challenges by simultaneously accelerating MR acquisition and correcting for any arbitrary motion in a compressed sensing reconstruction. In this work, the MC-CS framework is combined with parallel imaging for further acceleration, and is termed Motion Corrected Sparse SENSE (MC-SS). Validation of the MC-SS framework is demonstrated in eight volunteers and three patients for left ventricular functional assessment and results are compared with the breath-hold acquisitions as reference. A non-significant difference ($P > 0.05$) was observed in the volumetric functional measurements (end diastolic volume, end systolic volume, ejection fraction) and myocardial border sharpness values obtained with the proposed and gold standard methods. The proposed method achieves whole heart multi-slice coverage in 2 min under free breathing acquisition eliminating the time needed between breath-holds for instructions and recovery. This results in two-fold speed up of the total acquisition time in comparison to the breath-hold acquisition..