Cardiac Magnetic Resonance: Dimensions, Volumes and Mass

Fully automated cardiac assessment for diagnostic and prognostic stratification following myocardial infarction

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Background: Cardiovascular magnetic resonance (CMR) imaging is considered the reference methodology for cardiac morphology and function but requires manual post-processing. Whether novel artificial intelligence (AI) -based automated analyses deliver similar information for risk stratification is unknown. Therefore, this study aimed to investigate feasibility and prognostic implications of AI-based analyses.

Methods: CMR data (n = 1017 patients) from two myocardial infarction multi-center trials were included. Analyses of biventricular parameters including ejection fraction (EF) were manually and automatically assessed using conventional and Al-based software. Obtained parameters entered regression analyses for prediction of major adverse clinical events (MACE) defined as death, reinfarction or congestive heart failure within one-year after the acute event.

Results: Both manual and uncorrected automated volumetric assessments showed similar impact on outcome on univariate (LVEF HR 0.93, [95% CI 0.91-0.95]; p < 0.001 for manual and HR 0.94 [0.92-0.96]; p < 0.001 for automated) and multivariable analyses (LVEF HR 0.95, [0.92-0.98]; p = 0.001 for automated). Manual correction of the automated contours did not lead to improved risk prediction (LVEF AUC 0.67 automated vs. 0.68 automated corrected, p = 0.49). There was acceptable agreement (bias: 2.6%, 95% limits of agreement [LOA] -9.1-14.2%, intraclass correlation coefficient [ICC] 0.88 [0.77-0.93] for LVEF) of manual and automated volumetric assessments.

Conclusions: User independent volumetric analyses performed by fully automated software are feasible and results are equally predictive of MACE compared with conventional analyses in patients following myocardial infarction.