Abstract: P6180

Septal negative work correlates inversely with septal scar in patients referred for cardiac resynchronization therapy

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Topic(s):
Imaging: Heart Failure

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Background: Myocardial scar is frequently present in patients with heart failure and left bundle branch block (LBBB), and associated with reduced response to cardiac resynchronization therapy (CRT). Furthermore, LBBB may be associated with markedly reduced strain, work, metabolism and perfusion in septum, even without septal ischemia. Therefore, it may be challenging to identify scar by functional imaging methods.

Purpose: To investigate the ability of advanced echocardiographic and nuclear imaging techniques to detect septal and left ventricular (LV) lateral wall scar in patients referred for CRT, compared to late gadolinium enhancement (LGE) cardiac magnetic resonance.

Methods: Scar was quantified as percentage LGE in five septal and five LV lateral wall segments of 131 patients (age 66±10, 66% male, QRS-width 164±17ms) referred for CRT, 92% with LBBB. Longitudinal strain was assessed by speckle tracking echocardiography in 130 patients (652 septal and 631 LV lateral wall segments). Myocardial work was calculated by LV pressure-strain analysis. Systolic shortening defined positive work, while systolic lengthening defined negative work. Glucose metabolism was assessed by 18F-fluorodeoxyglucose (FDG) Positron Emission Tomography (PET) in 52 patients (260 septal and 260 LV lateral wall segments). Perfusion was assessed in 46 patients (230 septal and 230 LV lateral wall segments) by either 13N-ammonia PET (n=32) or Single Photon Emission Computed Tomography (SPECT) (n=14). Metabolism and perfusion were reported as percentages of the segment with maximum tracer uptake. We evaluated parameter relationship to scar with Spearman correlation (rs) and regression analysis.

Results: LGE was present in 198 septal (30%) and 136 LV lateral wall (21%) segments. In a multivariate regression model with negative work, metabolism, perfusion and peak strain, only the first three parameters showed a significant association with LGE percent in septum (p<0.001, p=0.022 and p<0.001, respectively), while peak strain did not (p=0.270). Negative work in septum correlated inversely with percentage septal LGE-uptake (rs=-0.33): increasing amount of scar was associated with less negative work (Figure).

In the LV lateral wall, however, negative work did not show a significant association with percentage LGE in univariate regression analysis (p=0.109). In a multivariate regression model positive work, metabolism and perfusion correlated with percentage LGE (p=0.049, p=0.008 and p<0.001), while peak strain did not (p=0.607).

Conclusions: Septal negative work correlates inversely with septal scar in patients referred for CRT. This finding is probably linked to LBBB, and may be explained by increased stiffness of scar tissue. Myocardial work, but not peak strain, reflects scar in the LV lateral wall. Future studies should explore the assessment of scar in the complete LV and how this relates to CRT response.

Two representative patients
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