Abstract: 553

Acute re-distribution of regional left ventricular work by cardiac resynchronization therapy determines long-term remodelling

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Topic(s):
Echocardiography: Systolic and Diastolic Function

Citation:

Background: In patients with dilated cardiomyopathy and left bundle branch block (LBBB), different regions of the left ventricle (LV) have been shown to perform different amounts of work. In this study, we investigate the acute impact of cardiac resynchronization therapy (CRT) on regional LV work distribution and its relation to long-term reverse-remodelling.

Methods: We recruited 140 heart failure patients, referred for CRT. Regional myocardial work was calculated from non-invasive echocardiographic segmental stress-strain-loop-area before and immediately after CRT. The magnitude of volumetric reverse-remodelling was determined from the change in LV end-systolic volume (ESV), 11±3 months after implantation. Characteristics of patients with the lowest and highest quartile of LV ESV reverse remodelling (LV ESV reduction of less than 10% and LV ESV reduction of more than -48%) were compared.

Results: Before CRT, myocardial work showed significant differences among the walls of the LV (Figure A). CRT caused an acute re-distribution of myocardial work, on average with most increase in the septum and most decrease laterally (all walls p<0.05) and lead to a homogeneous work distribution (Figure B). The acute change in the difference between lateral and septal wall work (ΔLateral-to-septal work) correlated significantly with LV ESV reverse-remodelling (r=0.63, p<0.0001). The smallest changes in work were seen in the patients with the least LV ESV reverse remodelling (Figure C, red markers), while patients with the most LV ESV reverse remodelling showed the largest changes in work (Figure C, green markers). In multivariate linear regression analysis, including conventional parameters such as pre-implant QRS duration, LV ejection fraction, LV end-diastolic volume and global longitudinal strain, the re-distribution of work across the septal and lateral walls appeared as the strongest determinant of volumetric reverse-remodelling after CRT (R²=0.393, p<0.0001).

Conclusions: The acute re-distribution of regional myocardial work between the septal and lateral wall of the left ventricle is an important determinant of long term reverse-remodelling after CRT-implantation. Our data suggest that modification of regional loading is the mode of action of CRT treatment.
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Acute redistribution of regional left ventricular work by cardiac resynchronization therapy (CRT) determines long-term remodelling.

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Conclusions: The acute redistribution of regional myocardial work between the septal and lateral wall of the left ventricle is an important determinant of long-term reverse-remodelling after CRT-implantation. Our data suggest that modification of regional loading is the mode of action of CRT treatment.

(* = p<0.05 between LV walls; § = p<0.05 between pre and post-CRT)