Relationship between left bundle branch block mechanical patterns and super-response to cardiac resynchronization therapy in patients with congestive heart failure

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Background: Left bundle branch block (LBBB) assessed by electrocardiography (ECG) is used in current clinical guidelines for patient selection to cardiac resynchronisation therapy (CRT). But percentage of non-responders among patients with congestive heart failure is high. Super-response (SR) to CRT was not enough described in clinical guidelines. We hypothesized that mechanical patterns of LBBB and parameters of mechanical dyssynchrony could be used as predictors of SR to CRT.

Aim: To assess a relationship of LBBB patterns defined by ECG and echocardiography with SR to CRT.

Materials and methods: 60 patients (mean age 54.5 ± 10.4 years) were examined at baseline and during follow-up: 10.6 ± 3.6 months. Patients were divided into groups: I group (n = 31) with decrease of left ventricular end-systolic volume (ESV) ≥30% (super-responders) and II group (n = 29) - decrease of LV ESV <30% (non-super-responders). Three strain-markers of LBBB assessed by Tissue Doppler Imaging (TDI) and Speckle Tracking Echocardiography (STE) were used: (1) early contraction of basal or midventricular segment in the septal wall and early stretching of basal or midventricular segment in the lateral wall (yellow arrows); (2) the early peak contraction of the septal wall occurred in the first 70% of the systolic ejection phase (blue arrow); (3) the early stretching wall that showed peak contraction after aortic valve closure (red arrows). The classic LBBB pattern was defined if all three strain-markers were present. The heterogeneous LBBB pattern was defined if two from three strain-markers were present.

Results: At baseline groups did not differ in main clinical characteristics, including QRS width and LBBB assessed by ECG. Mechanical abnormalities were found only in group I: SF (32.3% vs 0.0%; p = 0.001) and apical rocking (19.4% vs 0.0%; p = 0.024), as well as classic LBBB mechanical pattern (20.8% vs 0.0%; p = 0.05). The complex of heterogeneous LBBB mechanical pattern (HR 7.512; 95% CI 1.434 – 39.632; p=0.025), interventricular mechanical delay (HR 1.037; 95% CI 1.005 – 1.071; p=0.017) and longitudinal strain of interventricular septum mid segment (HR 0.726; 95% CI 0.540 – 0.977; p=0.035) had an independent relationship with SR. According to the ROC analysis the sensitivity and specificity of model in the prediction of SR were 77.3% and 91.3% (AUC = 0.862; p < 0.001).

Conclusion: SR is associated with both LBBB mechanical patterns assessed by STE and TDI. LBBB defined by ECG did not have significant association with SR to CRT.

Abstract Figure.