There is little consensus on optimal atrioventricular (AV) and ventricular-to-ventricular (VV) intervals in cardiac resynchronization therapy (CRT). The aim of this study was to examine a novel combination of Doppler echocardiography (DE) and three-dimensional echocardiography (3DE) for individualized AV- and VV-interval optimization compared to conventional electrocardiogram (ECG) optimization. In this double-blind, randomized controlled trial, 77 patients (male: 57, age: 68 ± 10 years) with severely reduced ejection fraction (EF), New York Heart Association (NYHA) class III or IV, and wide QRS complex (>120 ms) have been included. Patients were randomized to either AV- and VV-interval optimization using DE and 3DE (group 1, n = 39) or ECG (group 2, n = 38). 3DE was performed in all patients for the evaluation of left ventricular (LV) dimensions, EF and systolic dyssynchrony index (SDI), and NYHA class obtained before CRT and after 3 months. Primary endpoint of the study was clinical response to CRT, defined as a reduction of NYHA class by >=1 score. Secondary endpoints were change of EF, LV volumes, and SDI. There were significantly more responders in group 1 (82%) than in group 2 (58%, P = 0.021). Similarly, group 1 showed a larger increase in
EF (7.0 ± 6.0% vs 3.4 ± 5.6%, P = 0.015) and a more pronounced reduction of SDI (-4.5 ± 5.9% vs -1.5 ± 5.6%, P = 0.039) than group 2. Compared with conventional ECG optimization, this novel echocardiographic optimization protocol resulted in a significantly higher response rate, improved LV systolic function, and may be used to select the optimal AV and VV intervals in CRT.