

Cardiac resynchronization therapy (CRT) represents an accepted treatment modality in patients with advanced chronic heart failure, acute and long-term benefit of which was confirmed in several clinical trials. Recently, reduced mortality and rate of hospitalization for heart failure were also demonstrated. However, response to CRT is interindividually highly variable with a substantial proportion of CRT recipients who do not respond to this therapy.

Although the identification of suitable candidates is probably the most important factor in the reduction of the rate of non-responders, some other determinants, peri- and post-implant, may substantially affect the final effect of CRT. The present PhD focused on some of these variables:

1/ First of them is a selection of the appropriate pacing mode. This PhD evaluated effect of 3 pacing modalities that have been proposed as alternatives of CRT – biventricular pacing (BiV), single-site left-ventricular pacing (LVP) and rightventricular bifocal pacing (Bif). It was clearly shown that the first two pacing strategies, BiV (it is simultaneous pacing of both ventricles) and LVP, cause comparable acute hemodynamic improvement at rest. Study No.2 of this PhD confirms that the comparable effect of BiV and LVP is preserved also during the exercise. In addition, study No.1 describes the character of ventricular activation during all 3 pacing strategies and explains the reasons for comparable hemodynamic benefit of BiV and LVP by restoration of more physiological activation sequence with merge of two activation wave fronts in the middle of the left ventricle. On the contrary, based on our experience from the long-term follow-up, Bif (simultaneous pacing from the apex and outflow tract of the right ventricle) is only rarely associated with the clinical improvement. Possible reasons for the inferiority of Bif as compared to BiV and/or LVP on the electrical level is the inability to correct the intraventricular asynchrony by Bif.

2/ Besides the selection of pacing mode, the pacing site is very important determinant affecting the final outcome of CRT. Optimal regions for insertion of the left-ventricular lead were studied by many investigators in the past. However, the issue of proper right-ventricular (RV) lead positioning in BiV was not addressed before. In fact, our study has been the first one that has demonstrated incremental benefit when using RV midseptal region as compared to RV apex for long-term BiV (study No.3). More significant and earlier reverse remodeling of the ventricles has been observed when paced from the midseptal region.

3/ Last, but not least, the final benefit of CRT is titrated, at least partially, by the atrioventricular and interventricular delay programming (AVD and VVD) due to modification of the degree of inter- and/or intraventricular resynchronization. Study No.4 of this PhD indicates that the cardiac output changes with selected AVD and VVD, with the optimum usually around 120ms and 140ms for sensed and paced AVD resp. and preexcitation of the left ventricle in range 4-12ms for the VVD. Variable response to changed AVD and VVD setting in some patients, however, suggest the superiority of their individually-based optimization.