Impact of echocardiography-guided left ventricular lead placement on cardiac resynchronization therapy: an acute electro- and echo-cardiac comparative study

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Introduction: Cardiac resynchronization therapy (CRT) improves mortality and morbidity in patients with drug refractory heart failure (HF) with wide QRS complex and diminished left ventricular (LV) function, but the clinical outcome is variable with approximately 30% of non-responder cases. Echocardiography-guided (EG) left ventricular (LV) lead placement at the site of latest mechanical activation improves outcome in patients. The purpose of this study was to examine the acute effect of electro- and echo-cardiac function indexes between the CRT patients with and without EG LV lead placement.

Methods: Of the thirty-one patients who underwent CRT implantation during the period from March 2012 to June 2018, the electro (QRS width)-, and echo-cardiac parameters (left ventricular ejection fraction (EF), left ventricular diastolic and systolic dimension (Dd and Ds)) were measured in both pre- and postoperative status. These parameters were comparatively examined between the 20 patients, who received the speckle tracking echo assessment in order to determine the optimal the LV lead placement site (EG LV group), and the residual 11 patients, with conventional LV lead placement (Non-EG LV group).

Result: Preoperative electro-, echo-cardiac parameters and patient characteristics were comparable between the groups. All of the post-operative electro- and echo-cardiac parameters were significantly improved in the EG LV group (pre- vs. postoperative: QRS width, 159.1ms vs. 142.1ms; p<0.05, LVEF, 27.1% vs. 37.0%; p<0.05, Dd, 63.0mm vs. 55.3mm; p<0.05, Ds 55.1mm vs. 46.2mm; p<0.05), whereas no significant differences, except the Ds, were observed in the non-EG LV group (QRS width, 148.5ms vs. 134.3ms; p=0.20, LVEF, 32.7% vs. 37.7%; p=0.07, Dd, 61.2mm vs. 59.6mm; p=0.14, Ds 51.7mm vs. 48.9mm; p<0.05). Furthermore, the degree of echo-cardiac parameters (as ΔLVEF, ΔDd, and ΔDs) were also significantly, or tend to be improved in the EG LV group compared with non-EG LV group (ΔLVEF, 10.0% vs. 5.0%; p=0.06, ΔDd, 7.7mm vs. 1.5mm; p<0.05, and ΔDs, Ds 8.8mm vs. 2.8mm; p<0.05) (Figure).

Conclusion: CRT patients with EG LV placement yielded consistent improvements in acute electro-, and echocardiographic parameters compared with those without. This strategy for CRT may affect the long-term clinical outcomes.