Echo-Guided Left Ventricular Lead Placement Improves CRT Response

Written by Rita Buckley

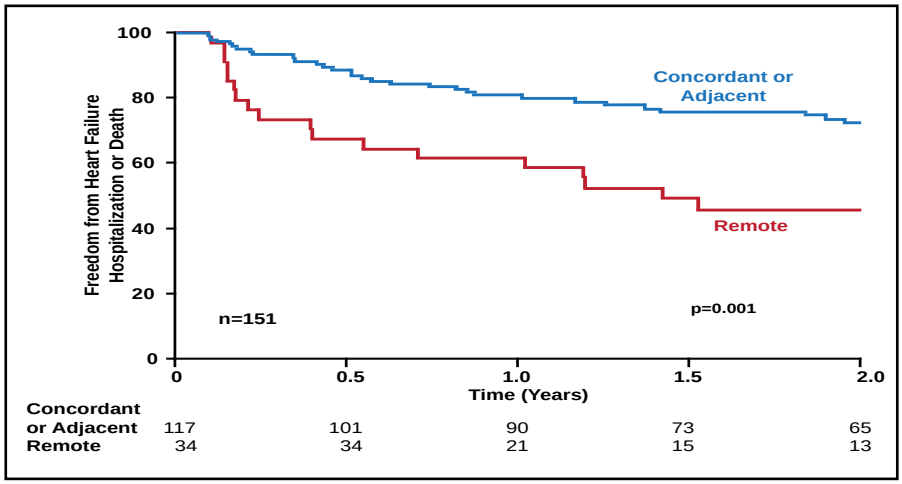
Cardiac resynchronization therapy (CRT) improves mortality and morbidity in heart failure (HF) patients with depressed ejection fraction (EF) and wide QRS complex, but response varies, with about one third of CRT recipients failing to improve. The Speckle Tracking-Assisted Resynchronization Therapy for Electrode Region trial [STARTER] tested the hypothesis that echo-guided left ventricular (LV) lead placement that targets the site of latest LV mechanical activation is superior to routine positioning for CRT. Samir Saba, MD, University of Pittsburgh, Pittsburgh, Pennsylvania, USA, reported findings from the trial.

A total of 187 patients with New York Heart Association Classes II-IV HF who were eligible for CRT, based on LVEF and QRS-duration criteria, were randomly assigned to device implantation with lead placement that was guided or not guided by speckle-tracking echocardiography. In each case, the site of latest mechanical activation was determined by assessing the time to peak radial strain that was associated with myocardial wall thickening. The primary endpoint was a composite of death or HF hospitalization.

Investigators found no significant difference in procedural or fluoroscopic times between the echo-guided and routine strategies. A higher rate (30%) of exact concordance of the LV lead with the site of latest mechanical activation was achieved in the echo-guided group compared with 12% (p=0.006) that occurred fortuitously in the group that was not guided by echocardiography (routine practice). Echo-guided placement was at the exact myocardial target or adjacent to it in 85% of patients in the echo-guided group versus 66% of those in the routine group (p=0.009).

Over 2 years of follow-up, the intention-to-treat primary endpoint of death or HF hospitalization was significantly lower in the echo-guided group compared with the routine LV lead positioning group (p=0.006). Rates of HF hospitalization or death were also significantly lower in the concordant or adjacent LV lead placement group versus remote positioning (p=0.001; Figure 1). The incidence of death or the need for transplant or LV assist device was significantly lower among patients with concordant or adjacent versus remote LV lead positioning (p=0.002).

Figure 1. HF Hospitalization or Death over Time by Echo-Guided or Routine Left Ventricular Lead Position.



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Official Peer-Reviewed Highlights from the

Heart Rhythm 2012
33rd Annual Scientific Sessions

In the STARTER trial, exact or adjacent concordance to the site of latest mechanical activation, as defined by speckle-tracking echocardiography, improved outcomes, including death/HF hospitalization-free survival and LV reverse remodeling and EF. Investigators concluded that a strategy of echo-guided LV lead delivery at or adjacent to the latest mechanical activation site is superior to unguided LV lead placement, as it improves patients' response to CRT.

The BENEFIT Trial: Predictors of Early Response to CRT

Written by Rita Buckley

Contractile reserve and echocardiographic dyssynchrony predict early response to cardiac resynchronizatiuon therapy (CRT), according to findings from the Risk Stratification and Benefits with Cardiac Resynchronization Therapy trial [BENEFIT; NCT00996086]. John Gorcsan, MD, University of Pittsburgh, Pittsburgh, Pennsylvania, USA, presented outcomes from the study.

The BENEFIT Trial was a multicenter, prospective, longitudinal study to identify clinical and echocardiographic factors that predict response to CRT. Dr. Gorcsan noted that response to CRT is multifactorial and may be influenced by clinical, procedural, and echocardiographic variables. The objective of the BENEFIT study was to test the hypothesis that contractile reserve, assessed by low-dose dobutamine echo and echo-Doppler dyssynchrony, predicts clinical response to CRT and reverse remodeling.

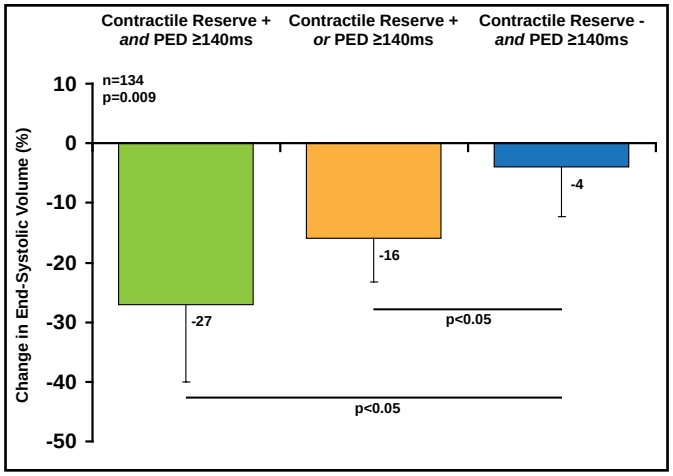
The study enrolled a total of 227 patients from 26 sites. Their mean age was 65±12 years (29% female), and all had New York Heart Association (NYHA) Class III-IV heart failure with QRS duration 157±24 ms (all ≥120 ms) and ejection fraction 29%±9% (all ≤35%); 52% had ischemic heart disease.

Prespecified cutoffs were used to assess contractile reserve, dyssynchrony, and speckle tracking radial strain for septal to posterior wall delay. Contractile reserve was determined by low-dose dobutamine echo wall motion score (WMS); the cutoff was an increase in WMS ≥0.2 with 10 µg/kg per min. Dyssynchrony was determined by Doppler pre-ejection delay (PED); the cutoff was ≥140 ms. The cutoff for speckle tracking radial strain for septal to posterior wall delay was ≥130 ms.

Three predefined CRT response endpoints were assessed at 6 months: improvement in NYHA class ≥ 1, increase in 6-min walk distance ≥10%, and decrease in end-systolic volume (ESV) ≥10%. Of 190 patients with 6-month follow-up available, 83% were a CRT responder by at least 1 criterion; 51% improved NYHA class; 47% improved 6-minute walk test; and 54% improved ESV.

Univariate analysis of 20 clinical and echo variables, PED, septal to posterior wall delay, and creatinine predicted both clinical and ESV response (all p<0.019). Of 134 patients with paired baseline and 6-month echocardiographs, contractile reserve and PED were additive in predicting ESV response (p=0.009; Figure 1). A forward multivariate model showed that contractile reserve, dyssynchrony by PED, and creatinine remained significantly associated with both clinical and ESV CRT response.

Figure 1. Left Ventricular Reverse Remodeling at 6 Months.



PED=pre-ejection delay.
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Contractile reserve by low-dose dobutamine echo and dyssynchrony by routine echo-Doppler are significantly associated with early clinical and reverse remodeling CRT response. These observations have important prognostic clinical implications.

However, a study of patients who are randomized to CRT, based on echocardiographic dyssynchrony, has yet to be carried out. This makes it difficult to assign a cause-and-effect relationship with certainty. Although it is logical that echocardiographic indices of dyssynchrony can be strongly associated with outcome after CRT, most believe that it is premature to change patient selection for CRT to imaging-based echocardiographic criteria at the present time [Gorcsan J & Prinzen FW. *Heart Rhythm* 2012].