EDITORIAL COMMENTARY

Go for the right left ventricular lead position at initial implantation of a cardiac resynchronization therapy device

Daniel Benjamin Fyenbo, MD,† Mads Brix Kronborg, MD, DMSc, PhD,† Jens Cosedis Nielsen, MD, DMSc, PhD†

From the †Department of Cardiology, Aarhus University Hospital, Aarhus, Denmark, and ‡Department of Clinical Medicine, Aarhus University, Aarhus, Denmark.

Cardiac resynchronization therapy (CRT) with biventricular pacing has substantially altered the clinical course of patients with heart failure (HF), reduced left ventricular (LV) ejection fraction (EF), and prolonged QRS duration. Multiple randomized controlled trials (RCTs) have documented that CRT significantly reduces HF hospitalization, cardiac morbidity, and mortality.1 However, approximately one-third of patients derive no measurable clinical or echocardiographic benefit from CRT,2,3 and such patients often are classified as so-called “nonresponders.” In this issue of Heart Rhythm O, Borgquist et al4 report a nice case series of 25 CRT “nonresponders,” presumably due to a suboptimal LV lead position, who clinically improved after the LV lead was repositioned in another branch of the coronary sinus (CS). These data are of clinical interest because they indicate that a thorough review of LV lead position and CS venography obtained during the initial CRT implantation should be performed in patients who do not benefit from CRT. If the LV lead position is judged to be suboptimal and another CS branch is available, reintervention should be considered. Although this strategy is often discussed in the literature and in daily practice, not much data exist supporting its use.

The current study was retrospective, and the cohort consisted of patients with a CRT device referred to a tertiary center between 2015 and 2020 for LV lead repositioning because of CRT “nonresponse” and a suboptimal, anterior, inferior, or apical LV lead position.5 How large a proportion of all “nonresponders” was referred for LV lead repositioning or how they were selected is unclear, particularly whether fluoroscopy and review of CS venography from the initial implantation procedure were performed before referral. Identifying alternative and presumably more optimal potential CS target branches on CS venography before deciding for reintervention may help to explain the large success rate with repositioning reported in the current study. In addition, how many of the patients were treated with quadripolar LV leads at their initial implantation was not reported. Using quadripolar LV leads results in more programming options for LV pacing, which may enable noninvasive solutions for initially nonoptimal pacing sites in a proportion of these patients.

Defining so-called “nonresponse” to CRT has varied widely, with poor agreement among definitions.5 In the current study, a combined score including subjective improvement or worsening/unchanged LV EF and QRS duration as well as N-terminal pro-brain natriuretic peptide level was used. Even though it may be difficult to investigate subjective parameters unblinded and without a control group, the mean improvement after repositioning is supported by the mean improvement in the remaining objective parameters. However, whether all patients ultimately scored better remains unclear, and whether this arbitrary categorization into “responders” and “nonresponders” is too simple and might underestimate the true benefit of CRT requires further discussion. Severe HF is a progressive disease state in many patients in whom freedom from progression and clinical worsening may be the beneficial effect that can be obtained from CRT. Such patients often are falsely counted as nonresponders in the binary classification between “responders” and “nonresponders.” Hence, the effect of CRT in any individual instead should be seen as continuous disease modification.6

A series of smaller RCTs has investigated the potential benefit of individualized strategies targeting the LV lead toward the latest activated segment. Different modalities and methods were used, and the results were divergent. However, RCTs have not documented better results from placing the LV lead in any specific position. Placing the LV lead in an inferior, anterior, or apical position has been found to be associated with less favorable outcomes in observational studies.7–9 These LV lead positions often are closer to the right ventricular (RV) lead position and unlikely to
result in successful resynchronization. However, strong guidelines on LV lead placement are unlikely to be published given the lack of well-performed RCTs comparing different strategies for LV lead placement.

Even though few complications occurred in this small cohort, it is well known that reinterventions for CRT systems are associated with a high risk of complications. Overall, the complication risk was 5%–15% for such interventions in a Danish national cohort study, and the risk of device-related infection resulting in system extraction was 3.4% after CRT reintervention in a large 2-center cohort. Therefore, reinterventions should be minimized by all means.

It is reassuring that repositioning the LV lead in some patients who do not experience any clinical improvement after CRT implantation seems to reduce symptoms and measures of HF severity. However, the strongest signal from the current case series may be that implanters should be trained to implant the LV lead in a posterolateral and nonapical position, if possible, and with a relatively large anatomic distance to the RV lead. Implantation of a CRT device preferentially should be performed in large-volume centers with several CRT implanters, and inexperienced implanters should have access to immediate backup from experienced colleagues if posterolateral placement of the lead is not readily possible. As indicated by the current data, prolongation of the QRS complex after CRT may be an indicator that optimal resynchronization has not been obtained and that an alternative LV lead position should be considered. Implementing these strategies potentially may reduce the proportion of patients with suboptimal placed LV leads and reduce the number of reinterventions. Today, conduction system pacing is an option that should be considered for patients in whom CRT does not yield the expected benefit and in whom the LV lead is not positioned optimally, especially if a presumably more optimal LV lead position cannot be obtained because of difficult anatomy or technical obstacles.

Funding Sources: Dr Fyenbo is funded by Aarhus University, the Danish Heart Foundation (Grant Number R140-A9482- B2407), Health Research Foundation of Central Denmark Region (Grant Number R64-A3194-B1667), and Gangstedfonden.

Disclosures: The authors have no conflicts to disclose.

Authorship: The authors attest they meet the current ICMJE criteria for authorship.

References
8. Thibault C, Donal E, Meunier C, et al. Sites of left and right ventricular lead implantation and response to cardiac resynchronization therapy observations from the REVERSE trial. Eur Heart J 2012;33:2662–2671.