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EDITORIAL

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Optimizing resynchronization pacing in the failing systemic right ventricle

Biventricular or cardiac resynchronization pacing therapy (CRT) is now an established modality to potentially improve clinical outcomes, as well as delay the need for cardiac transplant among patients with systemic ventricular failure. However, published guidelines for patient selection do not include the surgical interventions and anatomical variations, including a systemic right ventricle (RV), seen in the evergrowing number of adult patients with repaired congenital heart defects (CHDs), including those with repaired transposition of the great arteries (TGAs). In addition, guidelines do not address the issue of preexisting pacemakers, which are commonly found among these patients. Since these young adults can be expected to develop an early ventricular dysfunction and clinical heart failure, based simply on cardiac anatomy, and regardless of any coronary issues, it is imperative to explore therapeutic modalities that address the unique clinical challenges found in this patient population. Although CRT has been applied to CHD patients using current recommendations for patient selection, efficacy and clinical improvement rates have been variable. The overreliance on QRS morphology, as well as ventricular ejection fraction (EF) as primary markers of CRT efficacy, commonly reported among many publications, including guidelines, has recently come under scrutiny and questioned in an era of improved diagnostic imaging to detect changes in ventricular contractility.[1–3]

In this issue of *Pacing and Clinical Electrophysiology*, Moore et al[4] present a novel approach to determine the best epicardial lead implant site among six patients with TGA and previously implanted transvenous cardiac rhythm devices, utilizing current mapping techniques found in most cardiac electrophysiology laboratories. Electroanatomical mapping (EAM) provides 3-dimensional intracardiac electrical activation sequences in relation to anatomy in a cardiac chamber of interest. Typically applied during arrhythmia mapping, EAM decreases the need for fluoroscopy, as well as provides more precise substrate location, which is necessary for accurate ablation.[5] The hybrid catheterization laboratory technique employed in this study entails a minimally invasive surgical approach to right ventricular epicardial lead implant based on the findings of mapped late activation.[7] Once the epicardial lead was implanted, the lead was advanced to join with the established transvenous lead in the venous left ventricle to finalize the CRT pacing system. On a follow-up interval from 5-13 months, clinical improvement, based on the QRS duration as well as echo-derived fractional area of change (FAC) and New York Heart Association clinical classification occurred in all patients, with five patients being removed from transplant consideration and one receiving a transplant a year later.

Evaluation of systemic RV function poses a unique challenge to clinicians. The anatomical shape, as well as difficulties to achieve optimal visualization during cardiac ultrasound studies, often negates EF as an effective measurement of contractility. In this study, FAC was used, which in addition to other noninvasive techniques, such as strain, dP/dt, and tissue Doppler, can be more effective markers of contractility.[7] Additionally, the authors astutely report that the activation sequences are patient variable. This important observation confirms previous reports that there is no "one best" implant site to optimize paced contractility.[8] In this regard, the simple practice of merely implanting two ventricular leads, without knowledge of which locations ensure the optimal response, is an outdated and ineffective approach for pacing lead implant.

In the current era of technological advances, newer methods to more effectively measure myocardial contractility need to be explored. This is especially true considering morbidities associated with CRT implant. Moore et al introduce an effective combination of EAM with precise epicardial lead implant to optimize paced contractility in a difficult clinical situation of patients with systemic RVs and early heart failure.

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