iVIEW

EDITOR'S PAGE

Finding the Sweet Spot for CRT

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Heart failure patients with left ventricular (LV) ejection fractions of <35% who are on optimal medical therapy with QRS durations of ≥120 ms on surface electrocardiography have derived clinical benefit from cardiac resynchronization therapy (CRT). Although this well-established and guideline-recommended treatment has shown reductions in heart failure progression and risk for ventricular tachyarrhythmias, there are also shortcomings. Nearly one-third of patients with CRT implants fail to show clinical benefit. Although potential explanations for the lack of response to CRT may be multifactorial, one of the most important prerequisites for successful CRT is proper LV lead placement. And that can be technically challenging.

LV lead placement to deliver CRT typically involves cannulating the coronary sinus, performing coronary venous angiography, selecting a target vein, and advancing the pacing lead into the selected vein to achieve adequate resynchronization. Although it is still an evolving art, the success rate of CRT has been observed to be influenced by the contraction pattern and scar burden of the left ventricle, particularly in ischemic heart disease, as well as the relationship between LV pacing lead position and the area of electromechanical late activation. Thus, to guide LV lead placement, it is important for the operator to visualize both the myocardium and LV venous anatomy. In prior clinical trials, in which 2-dimensional visual correspondence of fluoroscopic venograms and echocardiographic views have been applied, one-third of patients had leads placed in incorrect positions. Despite a skillful technique, a lead implanter may not necessarily colocalize the venous anatomy with the myocardial segment, or perhaps the optimized LV lead position on the myocardial wall may not have a suitable venous branch for lead placement.

Myocardial perfusion imaging with either single-photon emission computed tomography or positron emission tomography is ideally suited for differentiating hypoperfused scarred myocardium from viable myocardium; these modalities also allow the assessment of regional and global dyssynchrony (1). Given that changes in LV lead position of as little as 20 mm could affect response to CRT, the development of a novel 3-dimensional (3D) toolkit, presented in this issue of *iJACC*, that fuses LV venous anatomy on fluoroscopic venograms with LV epicardial surface on single-photon emission computed tomographic myocardial perfusion for image-guided lead placement is a welcome addition to our armamentarium (2,3). The clinical feasibility of the 3D toolkit was tested and confirmed in a prospective image-guided LV lead placement in a patient during CRT in the cardiac catheterization laboratory. This integrated imaging approach represents a step forward, and the approach may continue to evolve as its clinical utility is tested in larger randomized patient population with a control and/or comparator group to assess patient outcomes. If validated, the potential of using 3D image-guided approach to improve the accuracy of lead placement can be significant.

The past several years have produced tremendous growth and expansion in the field of cardiac imaging. Along with this growth has come a concomitant appreciation for the importance of image-guided therapeutics. Techniques that guide accurate lead positioning might facilitate the progress and development of a more personalized lead placement strategy on the basis of the underlying myocardial pathologic substrate. However, such techniques can be useful only if they ultimately improve clinical

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management and patient outcomes. Therefore, we applaud the ongoing clinical trials of advanced image-guided techniques that provide 3D navigability to optimize LV lead position to find the "sweet spot" for CRT.

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