IMAGES IN CARDIOLOGY

Improved Cardiac Output with Right Ventricular Septal Pacing in a Patient with Right Bundle Branch Block and Left Ventricular Dysfunction

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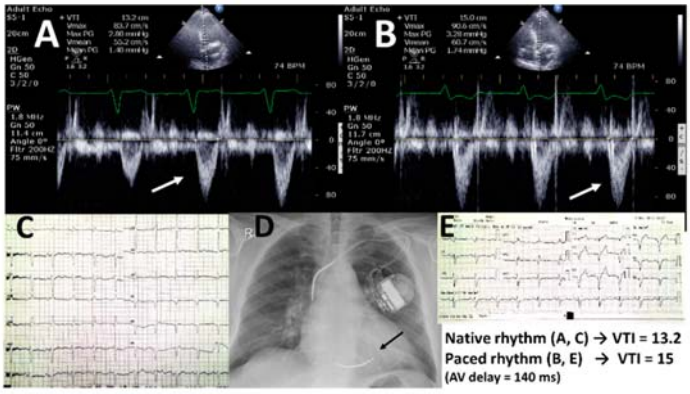
ABSTRACT

Alternate site pacing improved the left ventricular outflow tract velocity time integral (surrogate of cardiac output) compared to native rhythm in a patient with ischemic cardiomyopathy and severe left ventricular dysfunction with underlying right bundle branch block (***Rhythmos 2016;11(1):12-13***).

Key Words: heart failure; cardiac resynchronization therapy; implantable cardioverter defibrillator; Doppler; right bundle branch block; velocity time integral

Abbreviations: AV = atrioventricular; CRT = cardiac resynchronization therapy; ECG = electrocardiogram; ICD = implantable cardioverter defibrillator; LBBB = left bundle branch block; RBBB = right bundle branch block; VTI = velocity time integral

A 55-year-old gentleman with ischemic cardiomyopathy and severe left ventricular dysfunction (ejection fraction 25%) received an implantable cardioverter defibrillator (ICD) for primary prevention of sudden cardiac death. Although he had New York Heart Association class II-III heart failure symptoms, he was not deemed a good candidate suitable for cardiac resynchronization therapy (CRT) as his electrocardiogram (ECG) displayed a right bundle branch block (RBBB) QRS morphology of 130 ms duration. During device implantation, an alternate to right ventricular apex site was selected for the endocardial lead which was placed in the right ventricular septum. After the procedure, an echocardiography Doppler study was performed to explore a possible differential effect of native versus right ventricular pacing. During both native and paced rhythm, the left ventricular outflow tract velocity time integral (VTI) was calculated, which is considered a surrogate measure of stroke volume and cardiac output. During native rhythm, VTI averaged around 13 cm (**Panel A**, arrow), which was clearly improved according to repeated measurements during paced rhythm with averaging values of 15 cm (**Panel B**, arrow). The patient reported subjective improvement of his symptoms with pacing, but it was too early to make any inferences with regard to its clinical significance. **Panel C** shows a 12-lead ECG with patient's native rhythm, **panel D** displays a chest X-ray showing the position of the pace-sense/defibrillating lead at the right ventricular septum (arrow), and **panel E** depicts an ECG with the paced rhythm (note the difference in QRS morphology). An atrioventricular (AV) delay of 140 ms had been programmed.



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Biventricular pacing effectively resynchronizes inter- and intra-ventricular function in patients with symptomatic heart failure and underlying dyssynchrony due to intraventricular conduction delay, mostly in the form of left bundle branch block (LBBB), and more pronounced when QRS duration exceeds 150 ms.[1-3] However, in presence of non-LBBB conduction delay, cardiac resynchronization therapy (CRT) is far less beneficial.[4] Thus, in the present case, device implantation was limited to placement of a dual-chamber ICD alone.

Due to strong evidence of a possible deleterious effect of right ventricular apical pacing,[5-7] our team has long abandoned this classical approach and alternate site pacing, mostly selecting the right ventricular septum,[8] is routinely adopted in all patients receiving a pacemaker or ICD device. Some preliminary data indicate that right ventricular septal pacing may shorten and almost normalize the QRS duration in patients with RBBB, particularly when the pacing lead is implanted in a position close to the His bundle, and, more importantly, it may confer a favorable hemodynamic and clinical effect.[8-10]

In the present case, although the lead position was not an ideal paraHisian one (not very narrow QRS), pacing at this location was documented to provide a better hemodynamic profile with an important increase of cardiac

output as measured with calculation of VTI, as a surrogate of the left ventricular cardiac output. Of course, it remains to see whether this translates into sustained clinical benefit during follow-up. Finally, in search for optimal pacing sites, randomized studies will be needed to explore the issue whether alternate site pacing provides clinical benefit in certain groups of heart failure patients compared with biventricular pacing.

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