IMAGES IN CARDIOLOGY

Right Ventricular Septal Pacing: In Lieu of Biventricular Pacing for Cardiac Resynchronization in a Patient With Right Bundle Branch Block?

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Abstract

A 71-year-old male with ischemic cardiomyopathy, severe systolic left ventricular dysfunction and symptomatic heart failure was not considered a good candidate for implantation of a biventricular pacing system to effect cardiac resynchronization due to underlying right bundle branch block (RBBB). He received instead a dual-chamber implantable cardioverter defibrillation with the ventricular lead placed at an alternate site position at the high right ventricular septum. This resulted in significant narrowing of the QRS duration (resynchronization) with a good clinical response over short-term. The case illustrates a possible alternative approach to biventricular pacing for cardiac resynchronization in patients with RBBB. (***Rhythmos*** 2015;10 (3): 62-63)

Key Words: right bundle branch block; heart failure; cardiac resynchronization therapy; biventricular pacing; right ventricular septal pacing; paraHisian pacing

Abbreviations

CRT = cardiac resynchronization therapy; ICD = implantable cardioverter defibrillator; L/RBBB = left / right bundle branch block; NYHA = New York Heart Association

A 71-year-old male patient with ischemic cardiomyopathy, severe systolic left ventricular dysfunction (left ventricular ejection fraction ~25-30%) and symptomatic heart failure (NYHA class III symptoms) was considered for implantation of a biventricular pacing system. However, the electrocardiogram (ECG) displayed a right bundle branch block (RBBB) with a QRS complex duration of 160 ms (**Fig. 1, upper panel**). Due to the presence of non-left bundle branch block (non-LBBB) and data reporting a lower possibility of responding to cardiac resynchronization therapy (CRT) with biventricular pacing, it was finally decided to proceed with implantation of a dual chamber automatic cardioverter defibrillator (ICD) rather than a biventricular ICD (CRT-D). Thus, a right atrial lead was implanted in the right atrial appendage, but the right ventricular pacing-defibrillator lead was not placed at the classical right ventricular apical position, but an alternate site position was selected at the high right ventricular septum (**Fig. 2, arrow**), due to data indicating a deleterious effect of right ventricular apical pacing. The procedure was uncomplicated and the patient's post-procedural course remained uneventful. A post-implant ECG (**Fig. 1, lower panel**) showed an LBBB-like paced QRS morphology but with a much shorter duration (110 ms) compared to pre-procedural ECG (pacing latency was very short and pacing threshold was low at 0.9 volts at 0.5 ms pulse width consistent with para-Hisian pacing).

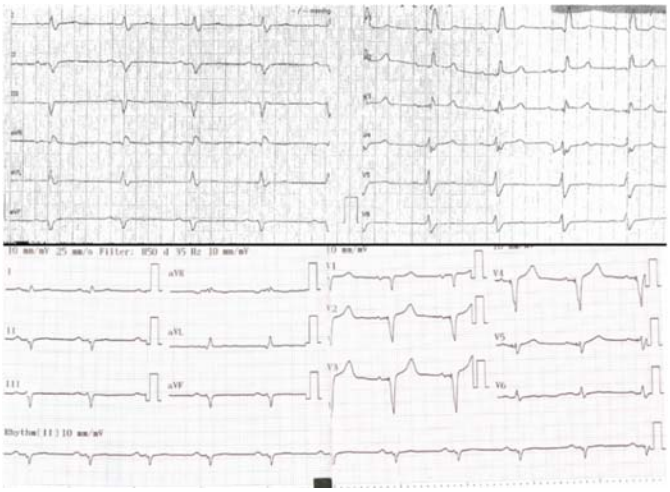

FIGURE 1. **Upper panel**: pre-procedural ECG; **Lower panel**: post-implantation ECG.

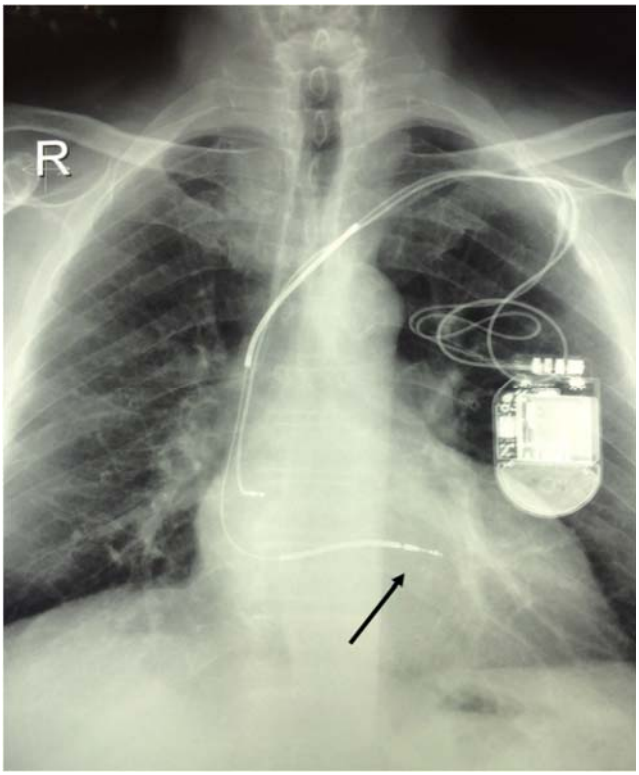

FIGURE 2. Chest X-ray (AP view) indicates the position of the two leads; the atrial lead was placed in juxtaposition to the right atrial appendage, and the right ventricular lead at the right ventricular septum (mid-septal position, arrow).

The patient had a good clinical response to this type of right ventricular pacing over the subsequent 3 weeks with amelioration of his heart failure symptoms. It remains to see whether this improvement lasts over mid- and long-term follow-up.

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Cardiac resynchronization therapy (CRT) has become standard practice for patients with reduced (≤35%) ejection fraction heart failure and cardiac dyssynchrony as manifested by a prolonged QRS complex (>120-130 ms) on the surface ECG.[1-3] Greatest benefit is derived when the QRS complex has a left bundle branch block (LBBB) morphology.[3] However, patients with a right bundle branch block (RBBB) may have a limited response to CRT.[4] Moreover, the procedure of placing the left ventricular lead in a suitable coronary sinus tributary may be cumbersome and time-consuming.[1,2] Nevertheless, in some patients with RBBB and very prolonged (>150 ms) QRS complex, it may be worth trying to effect CRT via biventricular pacing.[3]

In the present case the decision was made against biventricular pacing with an attendant longer-duration and higher-risk procedure. Thus, a standard dual-chamber ICD was implanted. However, due to reports and data of a possible deleterious effect of right ventricular apical pacing,[5] alternate site pacing was selected for this patient. Particular attention was paid to aim for a para-Hisian position, which was apparently successful as the resultant narrowing of the QRS complex was highly suggestive of such a position, despite the lack of guidance by endocardial electrogram recordings. This chosen strategy finally paid off and cardiac resynchronization was attained as indicated by the QRS narrowing (Fig. 1, lower panel).

Right ventricular septal pacing has been shown to shorten and almost normalize the QRS duration in patients with RBBB.[6] A favorable effect of septal pacing has been suggested compared to right ventricular apical pacing, particularly in patients with compromised left ventricular function.[7] This type of selective site pacing has also been suggested as an alternative approach for CRT in patients with RBBB and/or unsuccessful left ventricular lead implantation.[8,9] Favorable results of resynchronization may be obtained with this approach, but there have been no studies comparing this approach with standard biventricular pacing.

Biventricular pacing remains the standard means to achieve CRT, but in some patients with RBBB, whereby one expects limited response to CRT via the conventional approach or in difficult procedures of placing a left ventricular lead, right ventricular septal pacing with an aim to approximate a paraHisian position may be an alternative approach to obtaining CRT.[10] Future randomized studies will be needed to address the issue whether QRS normalization obtained via paraHisian pacing also affords clinical benefit in heart failure patients.

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