Hisian pacing restores cardiac function

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Abstract

We report a 57-year-old male patient with dilated cardiomyopathy, NYHA function class III and complete left bundle branch block (CLBBB) who received cardiac resynchronization therapy using His-bundle pacing (HBP) when a left-ventricular lead could not be placed. In 10 months’ follow up, his symptoms resolved rapidly, his QRS, left ventricular and left ventricular ejection fraction normalized. Recent reports support the conception that HBP may be an alternative or even better therapy for heart failure patients with CLBBB, especially if biventricular pacing is not feasible.

Keywords: His-bundle pacing; Cardiac resynchronization therapy; Heart failure; Left bundle branch block; Dilated cardiomyopathy

Introduction

Biventricular pacing (BVP) is commonly used to treat congestive heart failure (CHF) patients with complete left bundle branch block (CLBBB), however one-third of patients are non-response.1 His-bundle pacing (HBP) is rarely used in patients with CHF but may provide a good alternative option. Here, we present a case with dilated cardiomyopathy, NYHA function class III and CLBBB who received HBP therapy and had a super-response reaction.

Case presentation

A 57-year-old man with a one year history of exertional shortness of breath and one month history of paroxysmal nocturnal dyspnea was admitted on Jan 5, 2012. The patient’s medications included digoxin, furosemide, antisterone and benazepril. No history of alcohol abuse. ECG showed sinus rhythm and CLBBB with QRS complex duration of 200 ms (Fig. 1A). Echocardiogram showed left ventricular end-diastolic dimension (LVEDD) of 68 mm and left ventricular ejection fraction (LVEF) of 24.7%. Chest X-ray revealed enlarged cardiothoracic ratio of 57%. Coronary angiography revealed normal coronary arteries. BVP was aborted due to a lack of appropriate target vein in coronary sinus and HBP was therefore considered.

A standard diagnostic electrophysiology catheter was used to record the His potential. His-ventricular (H-V) interval was 140 ms. A 4 Fr actively fixed lead (Model 3830–69, Medtronic, USA), guided by a C304L-69 steerable catheter, was introduced via left axillary vein to the His bundle (HB) area. Normal QRS complex duration was achieved when the HB was paced via the lead. The lead was subsequently fixed. Pace threshold and Sensed potential of HBP lead were 2.5v/0.5 ms and 7.5 mV, respectively, and the pace-ventricle (Vp-V) interval was 53 ms. Pace ventricle conduction became 1:1 when paced at a rate of 120 bpm.

A CRT-ICD device (SJM, V-350) was then implanted, along with two active leads, which were placed in right auricle and right ventricular apex. The HBP lead was connected to the left ventricular (LV) port of the CRT-D, which was programmed to DDDR, lower rate of 60 beats/min, paced/sensed atrio-ventricular (AV) Delay of 130/110 ms, interventricular delay of 80 ms (LV first), and HBP output of 5.0 v/0.5 ms.

Patient was followed up monthly after the device placement, and an ECG or Holter monitoring was obtained at each visit. The ECGs prior to procedure and at follow up are showed in Fig. 1A–C. The QRS was completely normalized from LBBB after HBP. Pace threshold of HBP remained at 2.5–2.75 v/0.5 ms during a 10 month period.

Patient was discharged on the day 9 on digoxin, Furosemide, antisterone and captopril. The symptoms were improved and exercise capacity was increased dramatically. Cardiothoracic ratio on chest radiography at 1.5 months after operation was reduced to 51%. At 3 months, he was able to...
walk 580 m within 6-minute. Echocardiogram showed LVEDD of 54 mm and LVEF of 50% at 3 months, and on 10th month visit LVEDD and LVEF were 50 mm and 60% respectively.

**Discussion**

We report a case where HBP normalized QRS and improved symptoms in a patient with refractory CHF. At the 10 month follow up visit, His LV became smaller and LVEF was normalized. we conclude that in this patient, HBP played an important role in reversing CHF. Several similar cases have recently been reported. All patients have similar features after HBP: CLBBB disappeared, QRS complex was normalized or approximate normalized, all were responders and 2 cases were super-responders.

Besides the criterion proposed by Deshmukh et al., patients with prolonged H-V interval and wide QRS complex, successful HBP is defined as the normalization of QRS complex and a reduction of the Vp-V interval to normal H-V interval, which is based on the theories of HB longitudinal dissociation.

LBBB results in desynchrony between ventricles and within LV, which in turn, causes ventricular remodeling and LV dilation, while dilation of LV can further aggravate LBBB. Correction of LBBB is of great benefit to decrease left ventricle in this vicious cycle, and it should be count as etiologic treatment if LBBB causes the dilation of LV. Barba-Pichardo reported that 52–81% of wide QRS blocks were restored to normal or near-normal by HBP, suggesting that the intrinsic activation sequence of both ventricles were maximally preserved by HBP. Theoretically, HBP may be a better Cardiac resynchronization therapy than BVP.

The long-term efficacy of HBP for HF patients with CLBBB is unknown. With the progress of heart disease, if the conduction disturbance extends beyond the lead insertion site, LBBB can reoccur. Recent reports support that HBP could be an alternative or even better therapy for heart failure patients with LBBB, especially if BVP is not feasible.

**References**


