

Permanent His Bundle Pacing – Real-Time Guided by Multipolar Catheter in Patient with Dilated Right Atrium

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INTRODUCTION

Long-term right ventricular (RV) apical pacing has been associated with cellular and structural changes in the ventricles, thereby resulting in an increased risk of death, heart failure, and atrial fibrillation (AF).¹ Permanent His bundle pacing (HBP) was first described in clinical practice in 2000 by Deshmukh et al.² They demonstrated successful HBP in 12 of 18 patients (67%) with chronic AF. Subsequently, a few European groups described the success of permanent HBP. Barba-Pichardo et al. reported a success rate of 65% in patients with atrioventricular (AV) block using standard pacing leads with retractable screws and manually shaped stylets.³ These studies routinely used a mapping catheter to localize the His bundle (HB). The development of tools such as the SelectSecure 3830 (Medtronic, Minneapolis, MN) and sheath (C315His, C304 SelecSite) have made these procedures more widely used. However, the tools are still limited, especially for patients with an enlarged right atrium.^{4,5} In this case report, we would provide a case of 70-year-old man presented with repeated dizziness and near syncope due to slow atrial fibrillation (30-40/min) with enlarged right atrium. The clinical condition was improved after permanent HB pacing under the real-time guided by multi-electrode catheter (EP-Star).

CASE REPORT

This 70-year-old man presented with near syncope due to slow AF (30-40/min). Holter's electrocardiography (ECG) showed several long pauses > 3 seconds. The echocardiography showed dilated right atrium (5 cm) (Figure 1A). Left subclavian vein was punctured and short 7F peel-away sheath to place the C315 His sheath through it. Pace sense analyzer was used to record intracardiac electrograms.⁵ However, it was difficult to approach the HB due to dilated right atrium by the C315.^{4,5} First, we put this 5 F multipolar catheter (EPstar His-RV Fixed, Japan Lifeline Co. Ltd) into RV through tricuspid annulus for back up pacing. Then we deflect the steerable catheter and let the catheter straddling the tricuspid annulus in its superior septum near His bundle. After that, we could detect the clear signal of His bundle from the one of these 4 electrode pairs of the catheter which could help us guiding the position (Figure 1B), and His bundle was recorded near the middle bipolar electrodes (HISRV5-6) with HV interval 50 ms (Figure 1C). Advanced the C315 near the bipolar electrode (HISRV 5-6) and 3830 lead was applied. R-waves as 3.2 mV were acceptable in AF. Via 12-lead, run a threshold test. Selective HB pacing occurred while pacing below 2.5 V/0.5 ms to 1.0 V/0.5 ms with stimulus to V 50 ms which was identical to HV interval (Figure 1D). The 12 lead ECG showed slow AF before the HB pacing (Figure 2A) and selective HB pacing with narrow QRS and stimulus to V 50 ms (Figure 2B).

DISCUSSION

Permanent HBP is thought to be the pacing modality that most closely resembles physiological cardiac conduction to date and has raised major interest during

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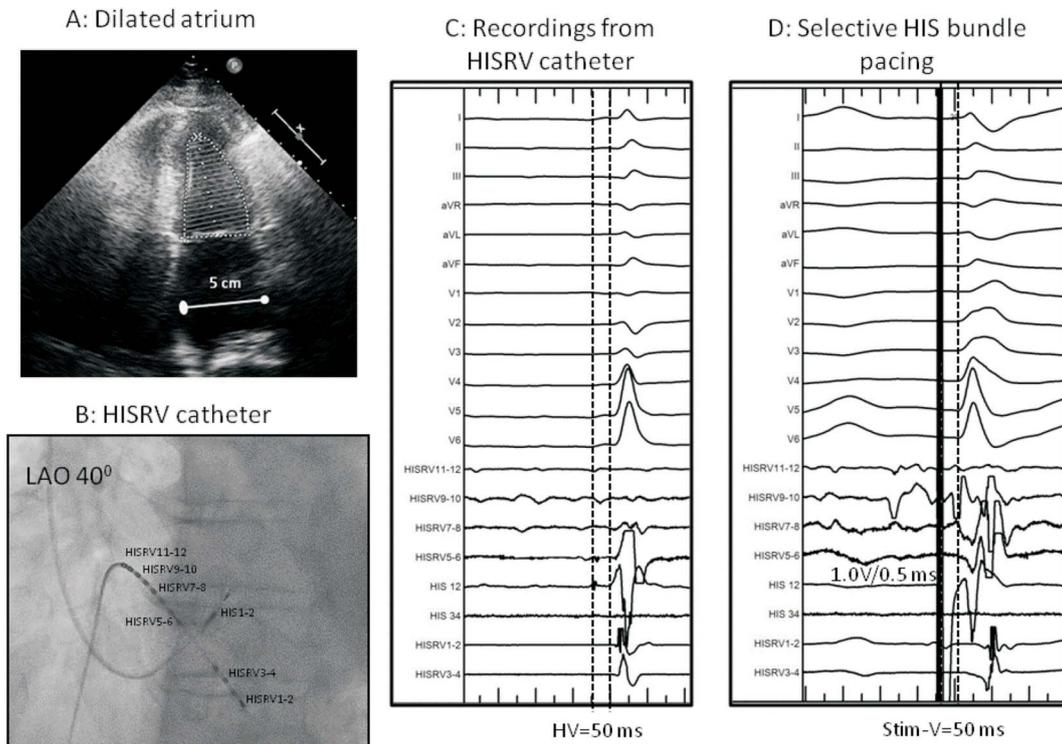


Figure 1. (A) Dilated right and left atria in the echocardiography. (B) A 5 F multipolar catheter (EPstar His-RV Fixed,) was used for back-up right ventricular (RV) pacing and mapping the location of His bundle (HB). (C) HB was near the middle bipolar electrodes (HISRV5-6) with HV interval 50 ms. (D) Selective HB pacing occurred while pacing 1.0 V/0.5 ms with stimulus to V 50 ms.



Figure 2. (A) Atrial fibrillation with slow ventricular responses. (B) Selective HB pacing with stimulus to V = 50 ms.

the last two decades. In 2000, the utility of HBP was first reported in patients with AF and cardiomyopathy undergoing AV node ablation and left ventricular (LV) function was shown to improve after HBP.² Recent studies and meta-analyses have demonstrated the superiority of HBP in preserving electrical synchrony and LV function compared to conventional right ventricular pacing.⁶ However, successful rates were around 67-80% in patients with AF. The tools such as the SelectSecure 3830 (Medtronic, Minneapolis, MN) and sheath (C315His, C304 SelecSite) have made these procedures more widely used. However, the tools are still limited, especially for patients with an enlarged right atrium.^{4,5} Three-dimensional electroanatomic mapping potentially offers a more systematic approach to a successful HBP lead placement. However, mapping adds to procedure duration and increases associated costs.⁷ Conventional mapping was performed by only 4-6 electrodes, which could not provide more information about the location of HB and need more manipulation to localize the HB.^{2,3} In this case with slow AF and enlarged right atrium, multi-electrode catheter (EP-star) had 12 electrodes and could provide more information about the location of HB by the multi-electrodes, which could help successful implantation of HB pacing. RV pacing is a conventional pacing model which could result in ventricular dyssynchrony and increase of incidence of heart failure.⁸ In this paper, HB pacing guided by multipolar catheter could provide a way to approach physiological pacing easily.

CONFLICT OF INTEREST

All the authors declare no conflict of interest.

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