

# Left bundle branch pacing as an alternative modality after His bundle lead removal

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His bundle (HB) pacing is the most physiological way of heart stimulation in patients with congenital total atrioventricular block. However, in some patients, the implementation of HB pacing may be challenging or they may lose HB capture during follow-up due to undersensing and/or increase of the HB threshold. For patients with HB pacing failure, the solution is to pace the distal ventricular conduction system or implement classic ventricular myocardial stimulation.<sup>1,2</sup>

We present a case of a 21-year-old woman with congenital complete atrioventricular block with a ventricular pacemaker (VVI) implanted in childhood. At the age of 18 years, due to poor tolerance of ventricular pacing, she was upgraded to a dual-chamber pacing system (DDD) with an introduction of successful nonselective HB pacing. A 4F lumenless lead was used for HB pacing (SelectSecure 3830 model, Medtronic Inc., Minneapolis, Minnesota, United States). The “old” right ventricular lead was abandoned as inactive (FIGURE 1A and 1B). However, after several months, an increased HB threshold was observed (increase from 1.2V @ 1.0 ms to >5V @ 1.0 ms), progressing to intermittent total loss of capture despite maximum pacing output (FIGURE 1C).

We attempted to remove the HB lead and to implant a new one to directly capture the left bundle branch (LBB). The 3-year-old HB lead was extracted using the unscrew and simple traction approach. No mechanical extraction tools were needed despite subocclusion of the left subclavian vein; no tissues were attached to the lead tip/helix. A new Medtronic 3830 lead was placed deep in the interventricular septum at the LBB region using

the Medtronic C315HIS delivery sheath (FIGURE 1D and 1E). The unipolar pacing threshold of 0.5 V @ 0.4 ms, R-wave amplitude of 14.3 mV, and impedance of 730  $\Omega$  were obtained. Electrocardiogram (ECG) showed characteristic QR morphology in lead V<sub>1</sub> during LBB pacing (FIGURE 1F). A short electrophysiological test (programmed stimulation and burst pacing, exploiting differences in refractoriness between the conduction system and working myocardium) confirmed LBB capture.<sup>3</sup>

HB pacing, in contrast to classic right ventricular pacing, most likely prevents pacing-induced cardiomyopathy, contraction dyssynchrony, and tricuspid valve dysfunction.<sup>1</sup> However, some aspects of this new pacing modality require better delineation. Especially, the effectiveness and consequences of HB lead extraction are not yet fully understood. In some patients with HB pacing failure, a new HB lead is implanted, leaving the “old” lead in the HB area, which may pose a problem of excess leads and cause lead damage over time. Therefore, we believe that it is reasonable to attempt to remove the dysfunctional HB lead, especially in young people. Implantation of the ventricular lead in the LBB region is feasible<sup>4</sup> and seems to be a good alternative for patients after failed HB pacing, as it offers much lower pacing thresholds, better sensing and “bypasses” the potentially damaged or fibrous region of HB.<sup>1,2</sup>

Our case illustrates that the failing HB lead, implanted for several years, can be safely, successfully, and completely removed and alternative conduction system pacing modality, still to provide the best hemodynamic response, can be successfully implemented at the same time.

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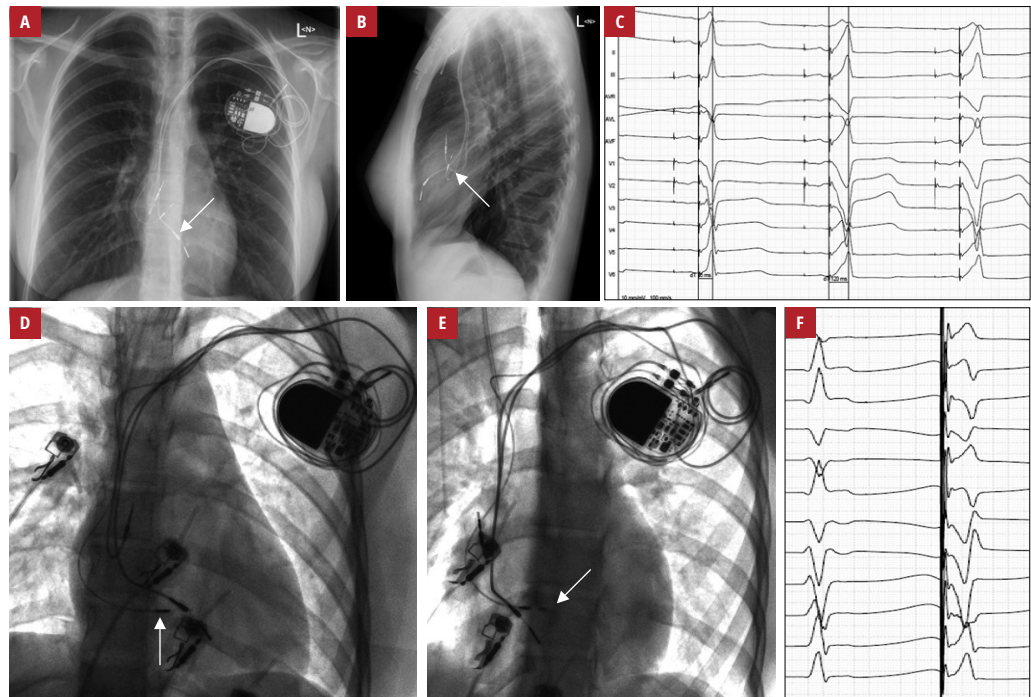
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**FIGURE 1** **A, B** – chest X-ray (posterior-anterior view and lateral view, respectively) showing the His bundle lead location before the extraction (arrows); **C** – intermittent loss of His bundle capture with sudden QRS widening; **D, E** – fluoroscopy (posterior-anterior view and left anterior oblique 30° view, respectively): both frames obtained after His bundle lead removal and implantation of left bundle branch (LBB) lead (arrows); **F** – programmed stimulation from the LBB lead: selective capture of LBB

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## REFERENCES

- 1 Ponnusamy SS, Arora V, Namboodiri N, et al. Left bundle branch pacing: a comprehensive review. *J Cardiovasc Electrophysiol.* 2020; 31: 2462-2473.
- 2 Vijayaraman P. His-bundle pacing to left bundle branch pacing: evolution of His-Purkinje conduction system pacing. *J Innov Card Rhythm Manag.* 2019; 10: 3668-3673.
- 3 Jastrzębski M, Moskal P, Bednarek A, et al. Programmed deep septal stimulation: a novel maneuver for the diagnosis of left bundle branch capture during permanent pacing. *J Cardiovasc Electrophysiol.* 2020; 31: 485-493.
- 4 Jastrzębski M, Moskal P, Bednarek A, et al. First Polish experience with permanent direct pacing of the left bundle branch. *Kardiol Pol.* 2019; 77: 580-581.