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Left Bundle Branch Pacing as an Alternative Pacing Modality After His Bundle Lead Removal

Short title: From His to left bundle branch pacing

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Conflicts of Interest:
AO – consultancy and lecture fees from Abbott, Biotronik, research fees from Medtronic and Biotronik, and travel expenses from HammerMed
JZK – investigator fees from Medtronic and Biotronik
MS- investigator, consultancy and lecture fees from Abbott, Biotronik, Boston Scientific, HammerMed, Medtronic
RB - lecture fees from Medtronic
MJ - consultancy and lecture fees from Medtronic and Abbott
His bundle (HB) pacing is the most physiological way of heart stimulation in patients with congenital total atrioventricular block. However, in some patients implementation of HB pacing may be challenging or they may lose HB capture during follow-up due to undersensing and/or increase of HB threshold. For patients with HB pacing failure, the solution is to pace distal ventricular conduction system or implementation of classic ventricular myocardial stimulation [1,2].

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

We attempted to remove the HB lead and to implant a new one for direct capture of the left bundle branch (LBB). The 3 years old HB lead was extracted using unscrew and simple traction approach. No mechanical extraction tools were needed despite sub-occlusion 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. The unipolar pacing threshold of 0.5V@0.4ms, R-wave amplitude of 14.3mV, and impedance of 730 Ohms were obtained. On the electrocardiogram (ECG) characteristic QR morphology in V1 lead was present during LBB pacing – shown on Figure 1, panel F. A short electrophysiological test (programmed stimulation and burst
pacing, exploiting differences in refractoriness between conduction system and working myocardium) confirmed LBB capture [3].

HB pacing in contrast to classic right ventricular pacing most likely prevents development of pacing induced cardiomyopathy, contraction dyssynchrony, and tricuspid valve dysfunction [1]. 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 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 [4] 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 [1,2].

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

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**Figure 1.** A. Intermittent loss of non-selective selective His bundle capture with sudden QRS broadening. B. Chest X-ray, PA view, C. Chest X-ray, lateral view – both show His bundle lead location before the extraction (white arrows). D. Fluoroscopy PA view, E. Fluoroscopy, LAO 30° view – both frames obtained after His bundle lead removal and implantation of LBB lead (white arrows). F. Programmed stimulation from LBB lead: selective capture of LBB.

*PA – posterior-anterior, LAO – left anterior oblique, LBB – left bundle branch*