# Pursuit of physiologic pacing

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We thank Drs. Zungsontiporn and Wu for their insightful comments on our study (1). Since the first wearable and later implantable pacemaker invention in late 1950s to early 1960s, pacemaker has undergone revolutionary changes and still continuing to evolve. It is now well understood that the conventional right ventricular pacing is associated with deleterious effects of right ventricular pacing induced cardiomyopathy (PICM), heart failure and increased mortality. Cardiac resynchronization therapy in the form of biventricular pacing (BVP) has been proven to be effective in patients with pre-existing left bundle branch block and severe left ventricular (LV) systolic dysfunction, improving ventricular function, heart failure outcomes and reduced mortality. In patients with normal His-Purkinje conduction and ventricular synchrony as in those with atrioventricular (AV) block or long PR intervals, BVP still results in prolonged ventricular activation time, ventricular dyssynchrony and may worsen cardiac function and clinical outcomes. The role of BVP in this group of patients with preserved LV systolic function remains unsettled. The Biventricular Pacing for Atrioventricular Block to Prevent Cardiac Desynchronization (BioPace) trial compared right ventricular pacing to BVP in more than 1,800 patients and reported no difference in the rate of the composite endpoint that included time-to-death or first hospitalization due to heart failure (2).

Even though the physiologic advantage of His bundle pacing (HBP) was demonstrated in an experimental study by Kosowsky *et al.* (3), about 5 decades ago and the clinical feasibility by Deshmukh *et al.* 20 years ago (4), only in recent years HBP has reached mainstream (5). We agree with Drs. Zungsontiporn and Wu regarding the limitations of HBP observed in our study (1). Nonetheless, the higher pacing thresholds and lead revisions observed in our study are comparable to LV pacing in BVP studies. More importantly, we believe that the radiation exposure, procedural duration and the cost of HBP will prove to be favorable compared to BVP.

Despite high right ventricular pacing burden many patients do not develop PICM. Only about 12–20% of patients develop PICM during medium-term follow-up. Identifying patients at increased risk for developing PICM and heart failure may provide a subset of patients most likely to benefit from physiologic pacing. Additionally, HBP has also been shown to correct chronic bundle branch blocks in patients with cardiomyopathy and heart failure (6). HBP provides an alternative option for providing cardiac resynchronization therapy in these patients.

HBP is an emerging technology and is likely to gain momentum in the coming years with further research and investment in improved tools and technology. There are already ongoing randomized controlled trials on HBP, which will add to the evidence base for HBP (7). With improvements in leads and delivery systems, and positive results from randomized clinical trials, HBP is likely to become the optimal pacing site of choice.

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## Footnote

*Conflicts of Interest*: PV, Speaker, Consultant, Research (Medtronic), Consultant (Boston Scientific, Abbott, Merritt Medical), Patent pending for His delivery tool. The other author has no conflicts of interest to declare.

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