Reaching the left bundle branch pacing area within 36 heartbeats

Marek Jastrzębski, Paweł Moskal

1st Department of Cardiology, Interventional Electrocardiology and Hypertension, Jagiellonian University, Medical College, Kraków, Poland

Correspondence to:
Prof. Marek Jastrzębski, MD, PhD,
1st Department of Cardiology,
Interventional Electrocardiology and Hypertension,
Jagiellonian University,
Jakubowskiego 2, 30–688 Kraków, Poland,
e-mail: mcjastrz@cyf-kr.edu.pl

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Left bundle branch (LBB) area pacing has emerged as a promising method of physiological pacing both for bradycardia and heart failure indications [1]. This method addresses some limitations of the His bundle pacing technique [2]. One of the critical aspects of LBB lead implantation is monitoring the depth of penetration into the interventricular septum. This is necessary to reach the LBB area while avoiding perforation into the left ventricle. Several measures to monitor lead depth were proposed, including fulcrum sign, sheath angiography, impedance monitoring, changes in the QRS notch in V1 lead, pacing from the ring electrode, monitoring of the endocardial signal, and observation of fixation beats, that is, premature ventricular contractions induced mechanically by the penetrating lead tip [3]. The presented ECG was obtained from a 65-year-old woman with heart failure and atrial fibrillation in whom atrio-ventricular node ablation and permanent pacing were planned to achieve rate control. The purpose of the report is to illustrate a novel LBB lead implantation technique, developed in our electrophysiological laboratory, based on continuous pacemapping during screwing in the LBB lead.

During lead progression from the right to the left side of the septum the paced QRS changes: QRS gradually narrows, R wave in V1 appears and V6 R-wave peak time (RWPT) shortens. The technique of continuous pacemapping, similarly to the premature beats method [3] is a practical application of this phenomenon. Instead of waiting for mechanically induced ectopic beats, however, local depolarizations are forced by continuous pacing from an external pacemaker that remains connected to the distal pin of the lead during the whole process of lead rotation/implantation.

Figure 1 illustrates a smooth transition from right ventricular capture to LBB capture during uninterrupted pacing at 120 bpm during lead rotation; it is a collage of 18 out of 36 consecutive QRS complexes (for unedited continuous tracing see Supplementary material, *Video S1*). A revolving connector for the distal pin of the LBB lead is a prerequisite for the presented technique. Preparation and use of a simple model of such connector are presented in Supplementary materials: *Video S1* and *Figure S1*.

The ability to monitor in real-time the paced QRS morphology is very valuable. Continuous change of paced QRS morphology ensures the operator that the lead is advancing into the septum and the appearance of R wave in lead V1 indicates that the LBB area was just reached. At this moment the lead rotations should be stopped to test for LBB capture. Conversely, lack of QRS morphology change is a sign that the lead is not making any forward movement but rotating in the same position ("drill behavior" [4]) — indicating that the lead support/forward pressure should be increased or the implantation site changed.

In contrast to the popular implantation method of interrupted pacing, the novel continuous pacemapping technique enables real-time monitoring of lead behavior and depth, facilitates reaching the LBB capture area with one lead rotation episode, allows detailed analysis of V6 RWPT change, and has the potential to limit the risk of septal perforation. We believe that such LBB lead implantation method is superior and might become a standard technique soon.

Supplementary material

supplementary material is available at https://journals.viamedica.pl/kardiologia_polska.

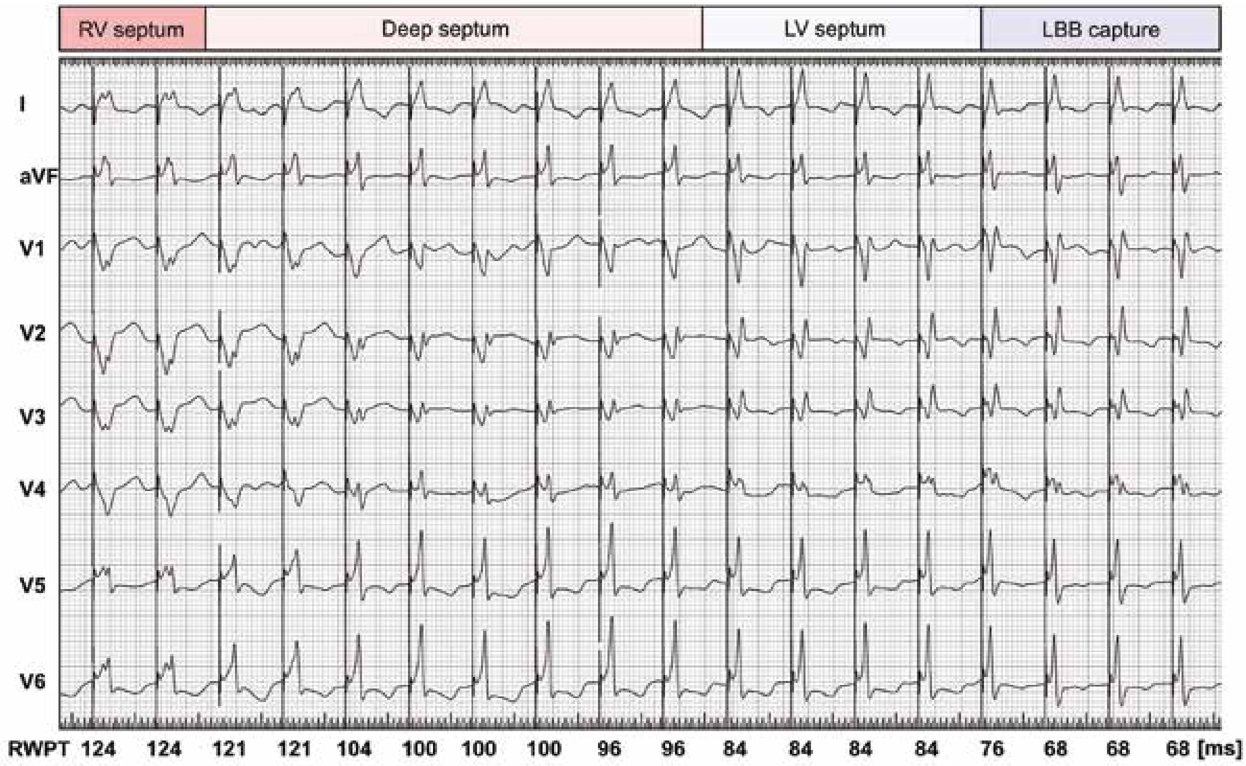

Figure 1. Continuous pacing during intraseptal lead deployment enables monitoring the continuous change of paced QRS complex morphology and lead depth in the septum. The right ventricular (RV septum) paced QRS is characterized by notches in lateral leads, "W" morphology in V1, and time to R-wave peak (RWPT) in V6 of >120 ms. Deep septal paced QRS is narrower, loses notches in lateral leads, the notch in V1 moves towards the end of QRS, and V6 RWPT is usually in the range of 120–95 ms. Pacing close to the left bundle branch area (LV septum) QRS is characterized by a positive terminal component in lead V1, the pseudo delta in leads V5-V6 and V6 RWPT of 95–80 ms. LBB capture paced QRS is characterized by deeper S wave in leads I, V5–V6, more prominent R in V1–V3 and V6 RWPT usually <80 ms. LBB capture in the current case was assured both by V6 RWPT <74 ms and transition to selective capture (not shown) [5]

Article information

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REFERENCES

1. Mafi-Rad M, Luermans JG, Blaauw Y, et al. Feasibility and acute hemodynamic effect of left ventricular septal pacing by transvenous approach through the interventricular septum. Circ Arrhythm Electrophysiol. 2016; 9(3): e003344, doi: 10.1161/CIRCEP.115.003344, indexed in Pubmed: 26888445.
2. Oręziak A, Zakrzewska-Koperska J, Sterliński M, et al. Left bundle branch pacing as an alternative modality after His bundle lead removal. Kardiol Pol. 2020; 78(12): 1293–1294, doi: 10.33963/KP.15621, indexed in Pubmed: 32988175.
3. Jastrzębski M, Kiełbasa G, Moskal P, et al. Fixation beats: a novel marker for reaching the left bundle branch area during deep septal lead implantation. Heart Rhythm. 2021; 18(4): 562–569, doi: 10.1016/j.hrthm.2020.12.019, indexed in Pubmed: 33359876.
4. Jastrzębski M, Moskal P, Hołda MK, et al. Deep septal deployment of a thin, lumenless pacing lead: a translational cadaver simulation study. Europace. 2020; 22(1): 156–161, doi: 10.1093/europace/euz270, indexed in Pubmed: 31722391.
5. Jastrzębski M, Kiełbasa G, Curila K, et al. Physiology-based electrocardiographic criteria for left bundle branch capture. Heart Rhythm. 2021 [Epub ahead of print], doi: 10.1016/j.hrthm.2021.02.021, indexed in Pubmed: 33677102.