

Right ventricular vs left bundle branch pacing-induced changes in ECG depolarization and repolarization

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Right ventricular pacing (RVP) has been conventionally used in patients with indication for cardiac pacemaker implantation as anti-bradycardia therapy. However, this form of pacing can cause ventricular dyssynchrony and lead to increased risk of heart failure and atrial fibrillation in some patients. Recently, left bundle branch area pacing (LBBAP) has been suggested as a new physiological pacing form with improved feasibility and safety. The purpose of this study was to compare changes induced by RVP and LBBAP in the standard 12-lead ECG.

10-minute ECG recordings were acquired from 38 patients (21 LBBAP, 17 RVP) at baseline and following 24 hours of continuous LBBAP or RVP. A spike removal strategy was implemented and median beats were calculated at baseline and post-implantation states (*Fig. 1A*). ECG markers describing heart rate, QRS and T wave characteristics were measured, including: RR interval, QRS duration (dQRS), QRS area (aQRS) and heart-rate corrected QT (QTc) and Tpeak-to-Tend (Tpec) intervals.

Both pacing forms significantly ($p < 0.01$) reduced RR interval by -217 ± 300 ms (RVP) and -255 ± 283 ms (LBBAP), as expected (*Fig. 1B*). While RVP prolonged dQRS (14 ± 42 ms, $p = 0.19$), LBBAP significantly narrowed dQRS (-21 ± 28 ms, $p < 0.01$). Similarly, RVP increased aQRS (40 ± 66 $\mu V s$, $p = 0.03$) whereas LBBAP reduced it (-28 ± 60 $\mu V s$, $p = 0.08$). Regarding repolarization characteristics, LBBAP induced more remarkable QTc shortening (-53 ± 52 ms, $p < 0.01$) than RVP (-36 ± 67 ms, $p = 0.06$). Also, Tpec shortened after LBBAP (-24 ± 45 ms, $p = 0.1$) without practically changing after RVP (-8 ± 37 ms, $p = 0.97$).

In conclusion, LBBAP led to more synchronized ventricular depolarization and reduced heart rate-corrected repolarization intervals than RVP, supporting potentially improved clinical outcomes with LBBAP as compared to RVP for anti-bradycardia therapy.

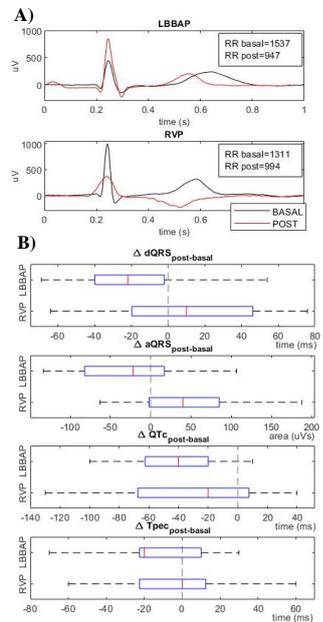


Figure 1: (A) Median ECG beats from LBBAP and RVP patients (B) Changes in ECG markers.