"Bi-bundle branch pacing" for persistent atrial fibrillation and third-degree atrioventricular block

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Introduction: Left bundle branch area pacing (LBBAP), as a novel pacing strategy, might be an alternative physiological pacing approach. However, in patients with normal His-Purkinje activation, LBBAP might cause pacing-induced right bundle branch block. Recently, we achieved “bi-bundle branch pacing” for a patient with persistent atrial fibrillation and third-degree atrioventricular block (AVB) with normal QRS duration (QRSd) during the LBBAP procedure.

Methods: A 68-year-old male patient had ten years of bradycardia history and palpitation for 4 months. Holter had showed persistent atrial fibrillation (AF) with third-degree AVB, presented with 1459 episodes of arrest over 2s and longest R-R interval 4.7s. Bi-atrial enlargement (LA 44×47×60mm, RA 48×64mm) and normal LV function (LVEDD 49mm, LVEF 55%) was shown in echocardiography evaluation. Another 24h-Holter examination in the next week was presented with 322 episodes of cardiac arrest (over 3s), and the longest R-R was 5.4s (8:47 AM). He also had a history of hypertension and cerebral infarction. The patient was indicated for pacemaker implantation and LBBAP procedure was achieved.

Result: During the procedure, the intrinsic heart rate was 40bpm and QRSd was 92ms (Figure 1A). Transseptal route by 3830 pacing lead and C315 His sheath (SelectSecure, 69cm, Medtronic, Minneapolis, Minnesota) via left axillary vein access was attempted. When the pacing lead reached the chosen site, pace-mapping at 2 V at 0.4ms was performed, the paced QRSd in lead V1 was 144ms (Figure 1B). After 4 rounds of rotation in this site, paced QRS complex in lead V1 was displayed incomplete RBBB morphology, with stimulus to peak left ventricular activation time (S-PLVAT) of 98ms (Figure 1C). Another 2 rounds of rotation was screwed and S-PLVAT was deceased from 98ms to 78ms and remained stable at different outputs (2V/0.4ms and 5V/0.4ms, Figure 2A and 2B). Paced QRSd was 114ms and LBB potential was recorded in IEGM (Figure 2C and 2D). The final position of the lead was shown in Figure 3. The final pacing parameters were as follows: the sensing amplitude was 16.6mv and the impedance was 577ohm. Routine optimization was performed after the procedure. Unipolar pacing strategy was shown that typical pacing induced incomplete RBBB pattern (Figure 4B). However, when the pacing strategy was changed to bipolar pacing at a output of 0.5V/0.4ms, pacing induced RBBB was disappeared and QRS morphology and axis was similar to the intrinsic rhythm (Figure 4A and 4C).

Conclusion: LBB Pacing-induced RBBB could be corrected by bi-bundle branch capture at the strategy of bipolar pacing at a low and stable output.