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IMAGE FOCUS

Left bundle branch area pacing as alternative to his bundle pacing for cardiac resynchronisation therapy: a case report

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Case description

A 74-year-old man suffering from severe heart failure (NYHA III – LVEF 28%) associated with left bundle branch block (LBBB) (Figure 1(A)) and uncontrolled permanent atrial fibrillation (AF) despite optimal medical treatment was referred for His ablation and rescue physiological pacing after a first unsuccessful LV lead implantation through the coronary sinus (CS). Careful review of the occluded CS angiogram indeed revealed no side branches. Concordantly, the patient was offered a 'rescue' HBP procedure. Using the SelectSecure lead (model 3830) and a C315 His sheath (Both Medtronic, Inc. MN), His mapping (HV = 106ms) and recruitment were easily obtained, unfortunately without LBBB correction. After several unsuccessful attempts to correct LBBB with HBP, the decision was made to directly pace the left bundle branch area. The same C315 sheath and 3830 lead were therefore advanced onto the right ventricular septum. There, unipolar mapping was used to identify the ideal implantation site according to the following criteria [1]: (a) 'W' QRS morphology in lead V1 with a notch close to the nadir, (b) R-wave ratio in lead II/lead III > 1 and R-wave discordance in aVR/aVL (c) R-wave sensing > 5 mV (Figure 1(C,D)). Subsequently, the 3830 lead was advanced through the ventricular septum with 6 clockwise rotations at first, followed by progressive further screwing with regular assessment of the paced QRS duration, QRS morphology and impedance. With progression of the lead through the ventricular septum, the Paced LV Activation Time (PLVAT) shortened and finally remained stable at different outputs suggesting the LV endocardium was reached. At that point, the achieved stimulus-to-end-QRS duration was 184 ms with a qR pattern in lead V1 (Figure 1(E)). Unipolar tip pacing demonstrated a stimulus-to-QRS latency of 30 ms. Contrast injection through the sheath was used to confirm the penetration depth of the electrode (Figure 2, left panel). Capture threshold was excellent (Unipolar: 0.75 V @ 0.5 ms) with good sensing values (>10mV). The lead was connected to the LV port of the CRT-defibrillator. With the excellent stability of the lead and its remote position from the His, AV node ablation was easily performed without changes in LBBAP characteristics (Figure 2, central and right panel). Three months post-implant, the patient presented with a near normalised LVEF (46%), no signs of LV dyssynchrony and a net improvement of his functional class (II).

Discussion

ACC/AHA/Heart Rhythm societies recommend AV junction ablation and cardiac pacing in patients with AF and uncontrolled ventricular rhythm under pharmacological treatment. Whenever the patient presents with a reduced ejection fraction, 'physiological pacing' by means of BVP is also recommended (Class IIa, Level of evidence B) [2]. However, LV lead placement through the CS might be hampered by numerous anatomical factors, e.g. the absence of side branches. In such clinical situation, HBP has been presented as an attractive

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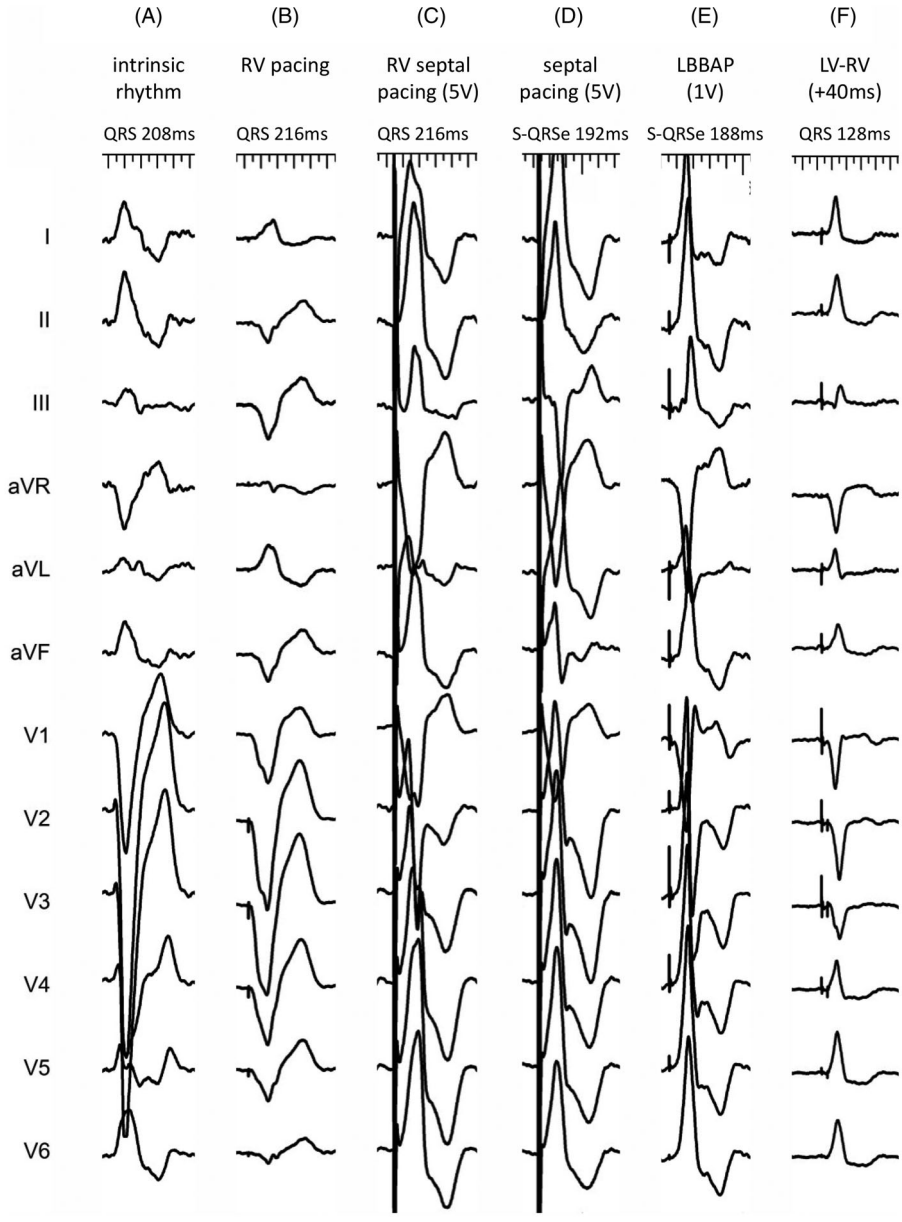

Figure 1. ECG recordings at different procedural times. (A) Baseline 12 leads-ECG (LBBB). (B) RV apex only pacing. (C) RV septal mapping at implant site note the typical 'W' pattern with a notch close to the QRS nadir in lead V1 (PLVAT 144 ms). (D) During septal screwing (PLVAT 128 ms). (E) LBBAP (PLVAT 116 ms). Unipolar tip pacing demonstrated a stimulus-to-QRS latency of 30 ms. 1-F. ECG during biventricular (LBBAP-to-RV +40ms). S-QRSe: stimulus-to-end-QRS; PLVAT: paced LV activation time, measured in lead v6.

bailout strategy, with even possible superior benefits compared to BVP in terms of electrical resynchronisation [3–5]. However, according to the level of conduction block, corrective HBP may not be achievable in all LBBB patients [6]. Furthermore, it is recognised that LBBB corrective HBP is limited by higher and often unstable capture thresholds leading to more lead revisions [7]. Finally, AV node ablation in HBP patients may compromise His lead functionality. Recently, Huang *et al.* demonstrated that CRT is also achievable by direct pacing of the left bundle branch area, below the region of septal block, with positive clinical and echocardiographic outcomes [8]. LBBAP has therefore been presented as an additional alternative to BVP and HBP both as a bailout strategy in patients with no accessible CS and in lieu of conventional BVP [9]. Our case illustrates the interest of LBBAP in patients with both an indication for CRT and AV junction ablation. Indeed, in addition to the fact that LBBAP rescued a failed BVP and a non-corrective HBP, the lower capture threshold along with the more stable and distal

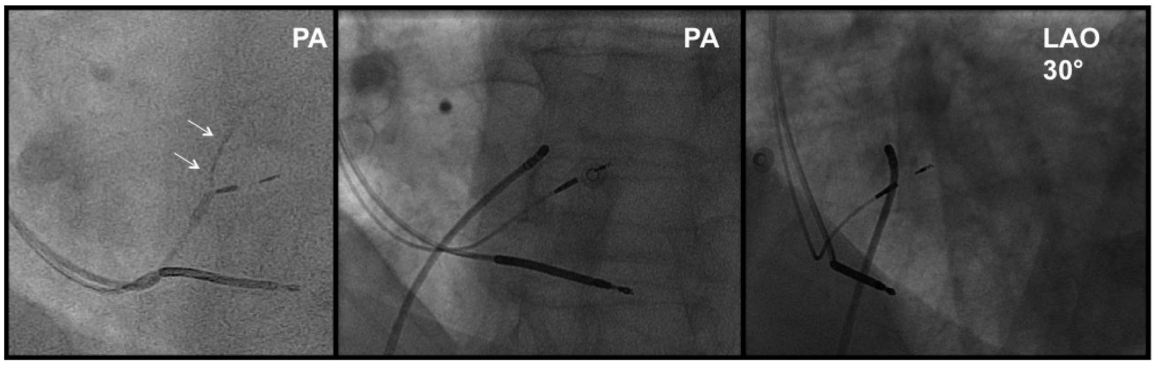

Figure 2. Images of the LBBAP lead implantation and AV junction ablation. Left panel: Postero-Anterior (PA) fluoroscopy view during contrast medium injection through the C315 sheath to assess the depth of penetration. The proximal electrode of the lead is not covered by contrast medium, demonstrating its full insertion into the inter-ventricular septum (white arrows: contrast along RV septum). Central and right panel: PA and 30° Left Anterior Oblique (LAO) fluoroscopy views during His ablation. Both panels demonstrate the remote position of the left ventricular lead from the His location. His ablation was safely performed 1.5–2 cm proximal to the LBBAP implant site.

positioning of the lead compared to HBP allowed for a safer and easier AV node ablation.

Conclusion

While awaiting for more robust evidence to propose LBBAP in lieu of conventional BVP for CRT, this physiological pacing strategy appears an appealing alternative for patients without favourable coronary sinus anatomy, particularly when HBP thresholds are high, non corrective or when a combined AV junction ablation is needed.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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