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CASE REPORT

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Right subclavian vein approach for selective left bundle branch pacing: A case report

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Abstract

We reported a 65-year-old man with symptomatic bradycardia caused by chronic atrial fibrillation who underwent pacemaker implantation by left bundle branch pacing (LBBP) via right subclavian vein (RSV) approach. A tricuspid valve annulus (TVA) angiography was performed, and a different connecting cable that can monitor electrocardiograms (ECG) and intracardiac electrograms (EGM) in real time was used during the process. By TVA angiography, we could easily find the ideal location of LBBP; a new connecting cable helped us avoid perforation and guide effective endpoint without the need to stop pacing. The case showed that it was feasible and safe to use the new method for LBBP through RSV route.

KEYWORDS
connecting cable, left bundle branch pacing, right subclavian vein, tricuspid valve annulus angiography

1 | CASE REPORT

A 65-year-old man with symptomatic bradycardia caused by chronic atrial fibrillation was referred to our center. After preoperative examination and informed consent were improved, we decided to perform single-chamber ventricular pacemaker by left bundle branch pacing (LBBP) for him. As such, a standard left subclavian vein (LSV) puncture was successful, but the guide wire could not pass through the vein. Angiography showed that the LSV was occluded (Figure 1a). Therefore, a right subclavian vein (RSV) route was considered. Fortunately, it was unobstructed. Then, a fixed curve sheath (C315 HIS; Medtronic Inc.) was pushed to right ventricle. After that, a right ventriculography in the right anterior oblique (RAO) 30° which can show the TVA was performed to ascertain the final position of LBBP (Figure 1b). The John Jiang's connecting cable that can monitor ECG and intracardiac EGM in real time from the pacing lead (Model 3830 69 cm; Medtronic Inc.) was connected to the electrophysiological multichannel recorder system (Shen, Jiang, Cai, et al., 2022; Shen, Jiang, Jiang, et al., 2022; Figure 1e). Compared with the traditional connecting cable, the John Jiang's connecting cable has an additional connecting channel. Through this channel, the tail of lead can not only fully contact it, but also rotate freely. In this way, the screwing process will not be interrupted. So when the sheath was in place, we started to screw the pacing lead with output of 2.0 V/0.5 ms. During this process, we monitored impedance, ECG, and EGM changes in real time until stimulus-ventricular potential interval (S-V interval) occurred on the EGM. After the pacing lead was in place, the fixation was performed. The screwing process is presented in Video S1. The pacing parameters were measured, the capture threshold was 0.5 V/0.5 ms, the R-wave amplitude 8.1 mV, and the impedance was 698 Ω. Finally, sheath angiography in the left anterior oblique (LAO) 45° view was performed to show that the depth of the LBBP lead was about 16 mm (Figure 1d), and then, the subsequent implantation processes were completed. Finally, the patient was discharged without any complications.

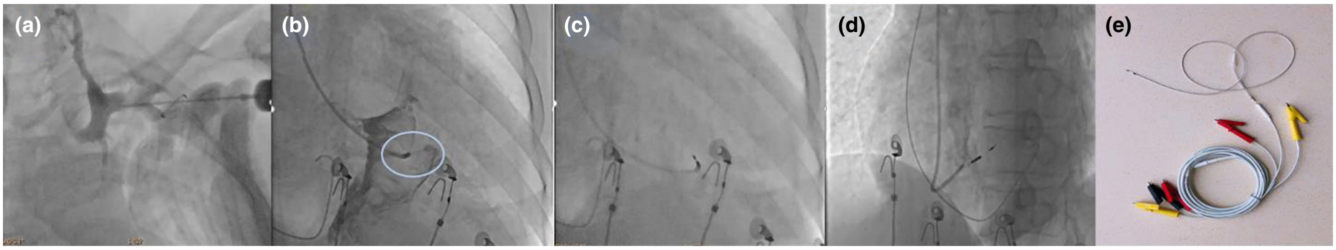

FIGURE 1 (a) Angiography showed an occluded left subclavian vein. (b) Fluoroscopic image with contrast injection to show the TVA and the position of LBBP (oval area) in RAO30°. (c) Location and shape of the pacing lead after screwing. (d) The depth of the lead in the interventricular septum was revealed by the contrast at LAO45°, and was about 16 mm. (e) The John Jiang's connecting cable with a connected lead.

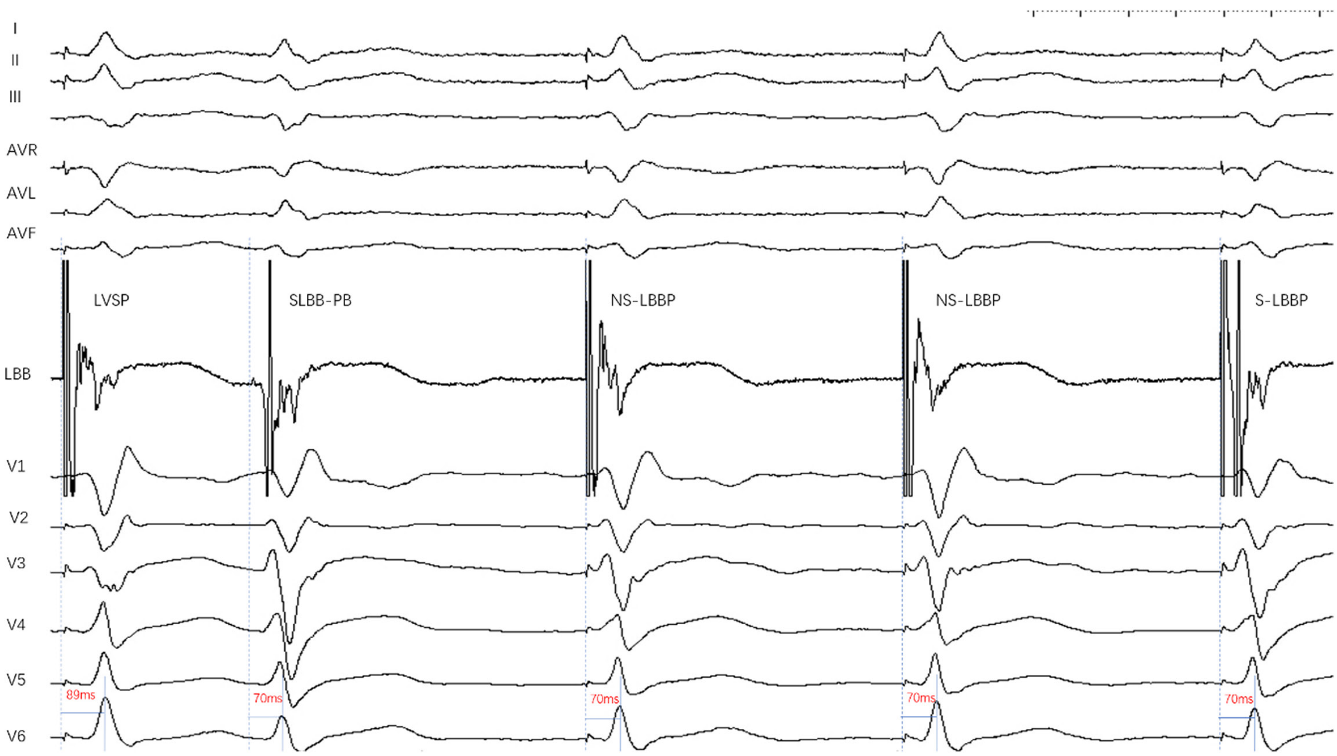

FIGURE 2 Characteristics of left bundle branch (LBB) capture; the paced QRS morphology shows right bundle branch conduction delay (RBBD) with an narrow rSR pattern in V1; the RWPT in V6 is 70 ms; there is an isoelectric interval which changes significantly between the pacing spike and ECG QRS onset in real time; LVSP (frst beat), SLBB-PB (second beat), NS-LBBP (third and fourth beat), S-LBBP (fifth beat). LVSP, left ventricular septal pacing; NS-LBBP, nonselective left bundle branch pacing; RWPT, R-wave peak time; S-LBBP, selective left bundle branch pacing; SLBB-PB, premature beat of selective left bundle branch.

2 | DISCUSSION

Left bundle branch pacing (LBBP) has been proved to be physiological and effective with stable and low pacing threshold, lead stability (Li et al., 2019), most of which pass through the LSV as a result of the shape of the sheath. Here, we present a case of LBBP via RSV route. The difficulty in this case is that the shape of C315 sheath is more suitable for the left path. The key to the success of this case lies in the use of TVA angiography to locate the left bundle branch area and a new connecting cable. TVA angiography helping for left bundle branch pacing from distal His-bundle (His) region has been proposed in recent study (Hu et al., 2019). Meanwhile, they have shown that TVA angiography could be performed to identify the anatomical location of proximal His, distal His, and septal cusp (Gu et al., 2019), so we proposed to perform TVA angiography to help us locate the ideal position of LBBP (Figure 1b). Thus, we could find the area quickly and accurately without mapping His potential. In addition, we used a more novel and important test cable called John Jiang's connecting cable. During the screwring procedure, the tail of pacing lead was always connected with the John Jiang's connecting cable. The recent research by our team has showed that the equipment might be more effective and convenient to monitor ECG, EGM, and impedance in real time to avoid perforation and to guide effective endpoint without the need to stop pacing (Shen, Jiang, Cai, et al., 2022; Shen, Jiang, Jiang, et al., 2022; Wu et al., 2022), so when the vascular pathway was established, TVA angiography was performed, and sheath was placed in what we thought the ideal position, the screwing of lead started. During the process, a narrow premature beat which shows right bundle branch conduction delay (RBBD) with an rSR pattern in V1 occurred (Figure 2). The V6 R-wave peak time (RWPT) for two adjacent paced beat was shortened abruptly to 19 ms with the same output (2 V/0.5 ms). Usually, premature beat often occurred during the lead screwing from right ventricular septum (VS) to left VS. Recently, we have reported that premature beat of selective left bundle branch (SLBB-PB) may be a novel marker for reaching and capturing the left bundle branch (Shen, Jiang, Cai, et al., 2022; Shen, Jiang, Jiang, et al., 2022), so when the SLBB-PB occurred, it means that the lead is closer to the conduction system. At this time, the lead screwing was stopped and the impedance was monitored frequently Immediately, an isoelectric interval on the ECG and an S-V interval on the EGM were recorded (Figure 2). In our recent study, we proposed a novel LBBP procedure that used isoelectric interval as an endpoint for lead implantation (Wu et al., 2022), so, based on our experience, the LBB was captured and the whole process lasted about 57 s and was successful at one time.

As far as we know, our case is the first demonstration of the feasibility and safety of LBBP by TVA angiography using a different connecting cable via RSV route. However, this is a special case, it does not represent all, but it may provide a feasible method for LBBP in the right path. Further studies of this method which may be more acceptable for achieving selective LBBP either by LSV or RSV approach are considered necessary.

AUTHOR CONTRIBUTIONS

LFJ, HMF and XHP performed device implantation. XHP and SJC wrote the manuscript. LFJ reviewed the manuscript. All authors read and approved the final manuscript. All authors agreed to their contributions.

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CONFLICT OF INTEREST

All authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

Data available on request from the corresponding author.

ETHICAL APPROVAL

Written informed consent was obtained from the patient.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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