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When the lead extractor becomes the assistant for new lead implant

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ABSTRACT

With the increasing number of cardiovascular implantable electronic device upgrade and vein obstruction caused by previous leads, it is important to have alternative techniques to upgrade the device with the maintenance of functioning leads.

We report an 83-year old male with 13-year old one-lead dual-chamber pacemaker, ischemic cardiac disease and pre-dialytic chronic kidney disease submitted to an upgrade to cardiac resynchronization therapy. A sub-occlusion in the transition of left brachiocephalic vein and the superior vena cava was documented. Re-permeabilization was only achieved with a TightRail™ rotating dilator sheath over a guidewire with successful left ventricle lead implant.

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1. Background

With the increasing evidence of the benefits of cardiac resynchronization therapy (CRT) in reducing mortality, heart failure hospitalizations and improving quality of life, the implantation of such devices have been increasing. Thus, upgrade from pacemaker into CRT devices are becoming more frequent, with its performance depending on the challenging left ventricle (LV) lead implant in coronary sinus. However, in patients with previous pacemaker leads, vein obstruction or fibrosis may turn new lead implants even more challenging, decreasing this therapy success.

This report first describes the use of TightRail™ rotating mechanical dilator sheath overcoming a sub-occlusion of left brachiocephalic vein, enabling the introduction of the LV lead in a CRT upgrade with the maintenance of the functioning previous lead.

2. Case report

An 83-year-old man with ischemic heart disease, chronic kidney disease and one lead dual-chamber (VDD) pacemaker implanted 13 years back was admitted in the hospital for pacemaker upgrade to CRT-P in view of worsening heart failure.

On admission, patient was pacemaker dependent and his basal ventricular rate was 40 beats per minute with complete atrioventricular block.

During CRT implant via left subclavian vein, a sub-occlusion in the transition of left brachiocephalic vein and the superior vena cava was documented, with no access to the right chambers (illustrated in Fig. 1). After several attempts to overcome the sub-occlusion, it was possible to cross it with a hydrophilic guidewire, introducing a 4F dilator and posteriorly an Amplatz Super Stiff™ guidewire. However, it was still not possible to introduce the LV lead delivery system despite considerable force. In order to cross and dilate the sub-occlusion, a TightRail Sub-C 9F (Spectranetics Corp, Colorado Springs, Colorado) rotating mechanical dilator sheath was used over the wire (depicted in Fig. 2a), which enabled the introduction of an extended hook 7F guiding sheath to cannulate coronary sinus. A quadripolar LV lead was then placed in a lateral branch of the coronary sinus with a good final result and no complications (Fig. 2b).

The procedure was performed in the pacing laboratory with the cardiac surgery team on standby. No complications were reported over a 6-month follow-up.

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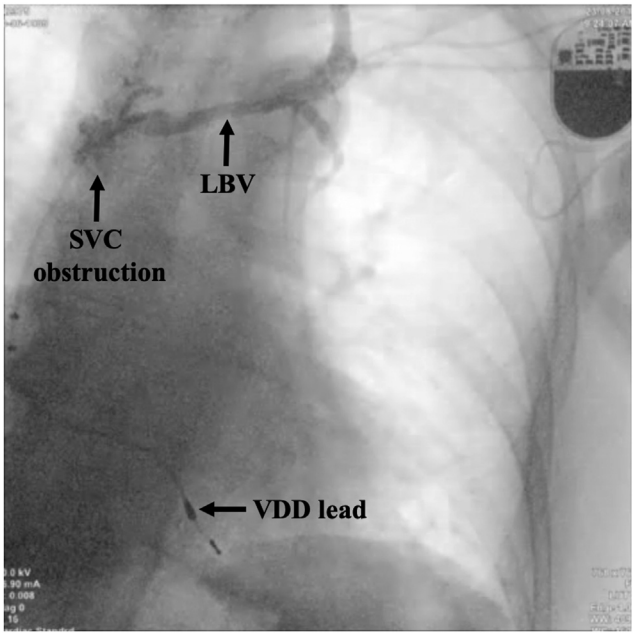

Fig. 1. Venogram demonstrating the near-complete occlusion of superior vena cava at the junction of left brachiocephalic vein and superior vena cava. LBV: left brachiocephalic vein; SVC: superior vena cava; VDD: one lead dual-chamber.

3. Discussion

Vein obstruction in patients with previous leads is a common complication with complete vein occlusion rates of 26% and vein stenosis between 75 and 99% in 9% [1]. In addition, in patients undergoing cardiovascular implantable electronic device upgrade there is a major complication risk of 15.3%, requiring thorough evaluation of all options [2].

One of the options for the upgrade would be to implant the system on the contralateral side. However, it is important to consider the patient's future vascular access. In our patient with an advanced chronic kidney disease in a pre-dialytic stage, this option would most probably take its toll when evaluating the vascular capital for hemodialysis. Furthermore, lead extraction or lead abandonment could also have a negative impact in the patient. The ELECTRa registry demonstrated a considerable major complication rates with a death rate of 5.5% with transvenous extraction of abandoned leads [3], which may have important implications regarding their management.

Alternatively, it would also be possible to extract the lead and re-implant a completely new resynchronization system homolaterally, as it was previously described by Menezes et al. [4]. However, this approach is being discontinued in nonrecalled and functioning leads due to the complication rates associated with lead extraction as high as 2–4%.

Another option to consider would be to refer the patient for a surgical epicardial lead system. This would also be a sub-optimal option considering the multiple comorbidities of the patient, the need for thoracotomy, general anesthesia, appreciable mortality and complications from the procedure such as post-pericardiotomy syndrome or erosion of epicardial patches that could be otherwise prevented.

Considering the above-mentioned options, the use of a functioning lead with the implant of the new LV lead enabled the upgrade from one-lead dual-chamber pacemaker to biventricular pacing, preserving the vascular capital on the contralateral side in a pre-dialytic patient, preventing the complications of an eventual lead extraction or abandonment and enabling an effective resynchronization.

Reviewing the literature regarding the TightRail rotating mechanical dilator sheath, there are two other case reports describing its transvenous extraction properties. Mammadli A et al. [5] described a transvenous extraction of pacemaker leads implanted 26 years earlier and Charalel RA et al. [6] described the off-label retrieval of a long-standing inferior vena cava filter. In this report, we first describe the use of a lead extractor TightRail™ rotating mechanical dilator sheath to cross and dilate a sub-occlusion over a guidewire in order to paradoxically enable the implant of a new LV lead in CRT upgrade.

This case highlights the importance of using all technical and material options to optimize CRT implantation.

Declaration of competing interest

None declared.

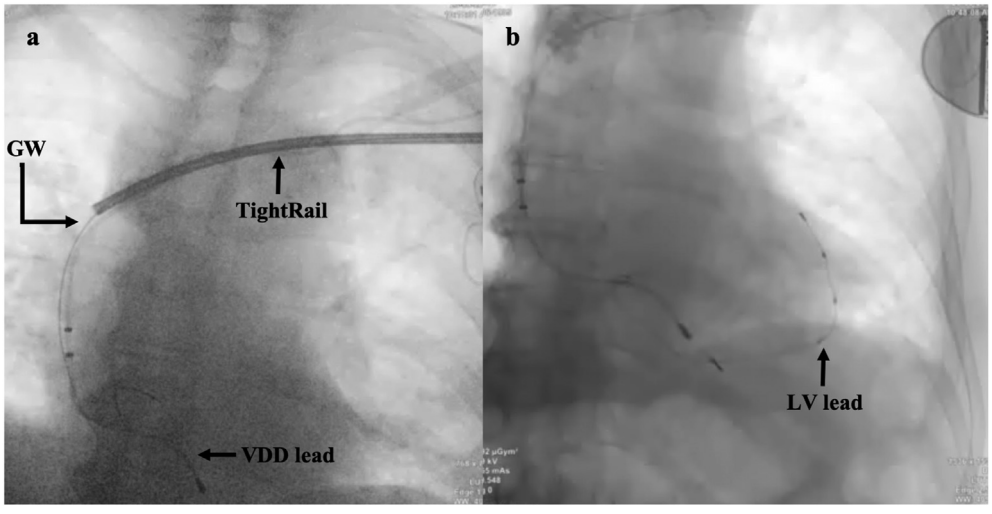

Fig. 2. a) Dilation of the sub-occlusion with the Tightrail™ Sub-C 9F dilator rotating mechanical sheath over the Amplatz™ super stiff guidewire; b) Left ventricle lead implanted in a lateral branch of coronary sinus. GW: guidewire; LV: left ventricle; VDD: one lead dual-chamber.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.ipej.2020.09.006.

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