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Venoplasty of a chronic venous occlusion with 'diathermy' for cardiac device lead placement

Enes Elvin Gul [a, *], Reda Abuelatta [a], Sohaib Haseeb [b], Mohammad Melhem [a], Osama Al Amoudi [a]

[a] Division of Cardiac Electrophysiology, Department of Cardiology, Madinah Cardiac Centre, Madinah, Saudi Arabia
[b] Division of Cardiology, Kingston Health Sciences Centre, Queen's University, Kingston, ON, Canada

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ABSTRACT

Venous revascularization is an approach used in patients with total venous occlusion requiring venous access for cardiac device lead placement. Several percutaneous approaches to venous revascularization have been proposed. For the first time, we describe the case of a 69-year-old male with total venous occlusion who was successfully revascularized using a 'diathermy' technique.

1. Case presentation

A 69-year-old male with complete heart block was implanted with a dual-chamber permanent pacemaker (Sensia SEDR01, Medtronic, USA) in 2013. The patient presented to the cardiac rhythm and device clinic for regular follow-up. Device interrogation showed a triggered elective replacement interval (ERI) and intermittent loss of right ventricular (RV) capture; RV lead threshold of 5.0 V/0.60 ms and impedance at 458 Ohms. The chest X-ray did not any signs of fracture or lead dislodgement. Transthoracic echocardiography revealed preserved left ventricular systolic function (LVEF 48%). The patient required battery replacement and RV lead implantation.

The patient was brought into the laboratory. Prior to the device procedure, left upper limb venography revealed an occluded vein at the level of innominate and superior vena cava (SVC) junction (Fig. 1A). The interventional cardiology and electrophysiology teams collaboratively performed the procedure. The left subclavian vein was accessed with a 7 French sheath, and using the femoral vein access site, a 7 French Ansel (ANL 1) long sheath (Cook Medical, USA) was advanced near the distal cap to establish access on both sides of the occlusion. Simultaneous injections through both sides revealed a long venous total occlusion with ambiguous proximal and distal stumps (Fig. 1B). A V-18 0.018 guidewire (Boston Scientific, USA) was used cross to the occluded segment; however, it was unable to puncture the distal cap. A Hi-Torque 0.014 Winn guidewire (Abbott Medical, USA) was used to puncture the distal cap. Despite successful drilling with several chronic total occlusions (CTO) guidewires, we could not cross the occluded part. At this stage, we decided to use 'diathermy' with the aid of a regular electrocautery machine. The Hi-Torque 0.014 Winn guidewire was connected to the electrocautery pen; 50 W of energy was applied to cross the distal segment of the occlusion (Fig. 2).

Retrograde angioplasty was performed using Sterling balloon (Boston Scientific, USA) (6 mm × 40 mm, at 14 arm) to facilitate antegrade and retrograde advancement of the guidewire into the SVC (Fig. 1C and D). A long SafeSheath® (Pressure Products, USA) was advanced through the subclavian vein, and a new RV lead (Tendril STS 2088TC, St Jude Medical, USA) was successfully placed to the RV septum (Fig. 1E and F). After obtaining good lead parameters, the lead was fixed to the fascia and attached to the new device (Endurity Core DR, St Jude Medical, USA). The previous lead was capped and the pocket was flushed with 80 mg Gentamycin and closed with 3 layers. The procedure was complicated by a large left-sided pneumothorax which resolved after chest tube insertion. The patient was discharged after a full recovery.

* Corresponding author.
E-mail address: elvin_salamov@yahoo.com (E.E. Gul).
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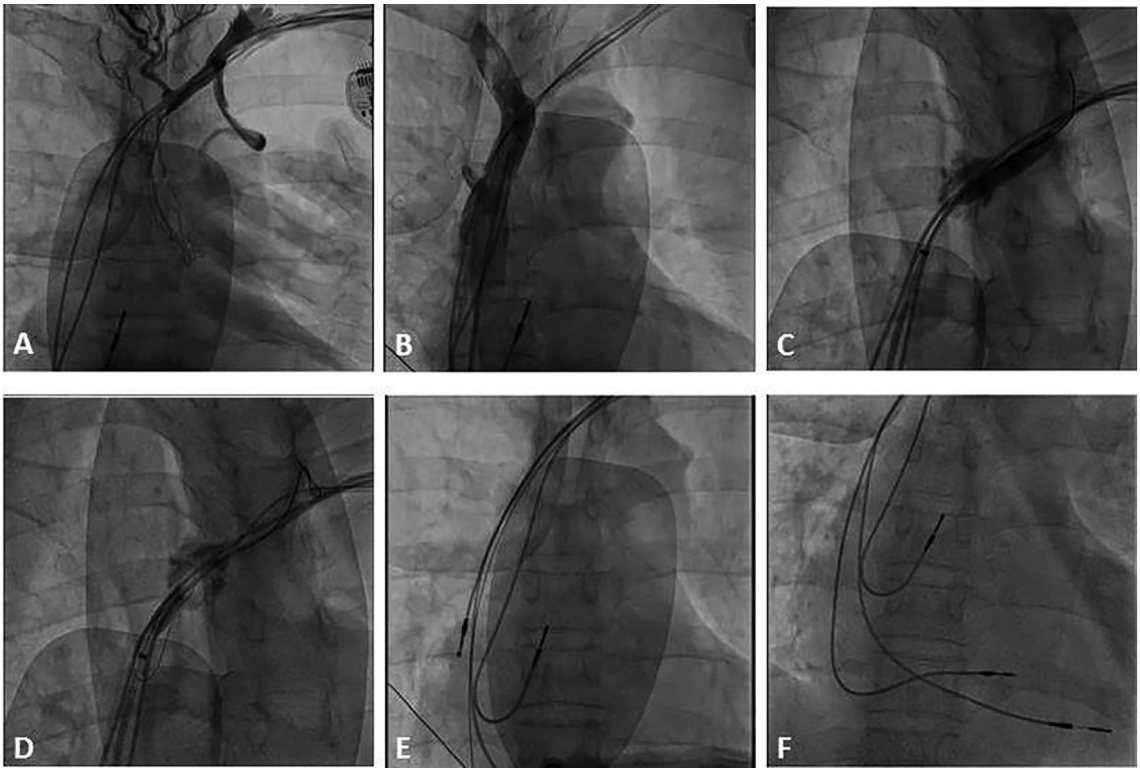

Fig. 1. Uper and lower venograms showing total occlusion at the level of innominate vein and SVC (**A** and **B**). Retrograde angioplasty (**C**) and successful antegrade advancement of the wire (**D**). Advancement and placement of the RV lead to the right ventricular mid-septum (**E** and **F**).

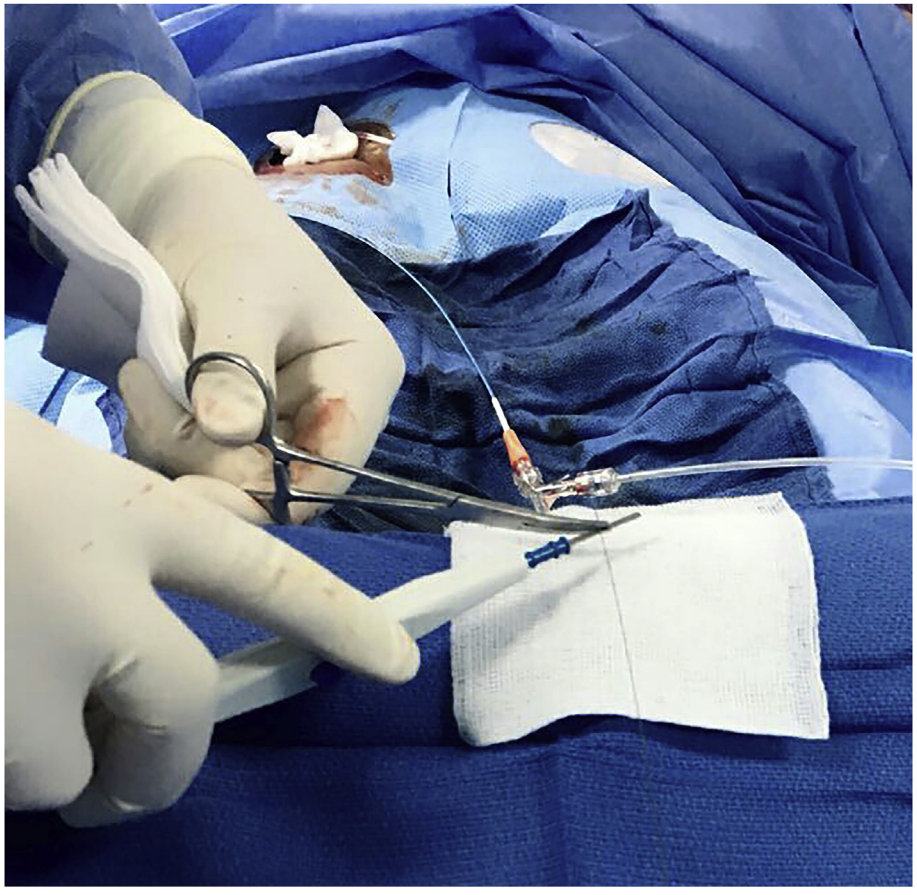

Fig. 2. Diathermy technique is demonstrated.

2. Discussion

Implantation of cardiac implantable electronic devices (CIED) is traditionally accomplished using transvenous access via the upper limb [1]. Venous access in patients with previous CIEDs can be challenging if there are vessel occlusions. Therefore, prior to device revision venography is usually performed to check for venous occlusions. If left-sided venous access is occluded or unavailable during the repeat procedure, other access options to device placement include contralateral venous access, mini-invasive surgical approach, extraction and subsequent implantation via antegrade access, or transeptal puncture with a Brockenbrough needle [2,3]. Leadless pacemaker insertion has shown promising results in patients requiring single chamber pacing [4].

Vascular occlusion is not uncommon in patients who are undergoing device upgrades [5]. Predisposing risk factors for venous occlusion in patients with existing pacemakers include a history of myocardial infarction, number of previously implanted leads, or absence of anticoagulation or antiplatelet therapy [1,6]. The incidence of subclavian venous occlusions is estimated to be as high as 5% in patients requiring device upgrades [7]. In 105 patients admitted for their first ICD generator replacement, 9% had complete occlusion of the insertion vein, 6% had severe occlusion, and 10% had moderate occlusion [8].

Percutaneous techniques for revascularization of stenotic veins or CTO have shown positive results [2,7–9]. Lead extraction is another alternative approach in experienced centers. So far there is no head to head comparative study of venoplasty versus lead extraction. We strongly believe that either of these approaches should be used according to the experience of the center. We describe a patient with total subclavian vein occlusion who underwent venoplasty using an antegrade and retrograde approach with the assistance of 'diathermy' for a successful lead placement. Diathermy using radiofrequency energy has been well described for challenging transseptal access [10]. To the best of our knowledge, this is the first case of venoplasty using a 'diathermy' technique that can be viewed as an alternative method and a teaching tool to successfully implant a new lead. To improve procedural success and reduce the complication risk, this procedure was performed with interventional cardiologists.

3. Conclusion

In patients with CIEDs and chronic venous occlusions, revascularization using 'diathermy' radiofrequency energy can be a safe and effective approach. Further studies are needed to parse out the implications of the aforementioned observations.

Conflict of interest and disclosure of funding

All authors declare that, the manuscript, as submitted or its essence in another version, is not under consideration for publication elsewhere, and it will not be submitted elsewhere until a final decision is made by the editors of IPEJ. The authors have no commercial associations or sources of support that might pose a conflict of interest. All authors have made substantive contributions to the study, and all authors endorse the data and conclusions.

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