Venous bifurcation stenting for pacemaker-induced superior vena cava syndrome

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Video clip is available online.

A 66-year-old woman presented with progressive bilateral arm and facial swelling deteriorating during the morning and following forward bending. Patient history revealed pacemaker implantation 12 years earlier for permanent, complete atrioventricular block. Duplex ultrasound demonstrated dilated veins of the arms and neck with absent respiratory flow modulation suggesting central venous obstruction. In the absence of clinical and laboratory signs of pacemaker system infection (ie, normal levels of C-reactive protein, normal leucocyte count, and negative blood cultures), computed tomography angiography revealed a high grade stenosis of the superior vena cava (SVC) and a total occlusion of the left brachiocephalic vein (LBV) along the course of the pacemaker leads (denoted by → and Δ, respectively, in *Figure 1, A*) confirming the diagnosis of postthrombotic SVC syndrome (SVCS).

For symptom relief, a staged procedure with explantation of the pacemaker system and placement of a temporary pacemaker via the right femoral vein was performed. Secondly, venous angiography was undertaken revealing a severe postthrombotic pathology with

Pacemaker-induced superior vena cava syndrome treated by bifurcation venous stenting (digital subtraction angiography).

CENTRAL MESSAGE

Endovascular revascularization and venous stenting provides a promising therapeutic option in patients with pacemaker-induced superior vena cava syndrome and severe refractory symptoms.

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prominent collateral flow via the azygos vein system (denoted by asterisk symbol in *Figure 1, B*, and shown in *Videos 1* and *2*). Successful recanalization with bifurcation venous stenting of the SVC and LBV was performed. Both lesions were treated utilizing self-expanding nitinol stenting systems. For the SVC, a 20 × 30 mm Sinus XL (Optimed, Ettlingen, Germany) and for the LBV, a 16 × 60 mm Blueflow (Plusmedica, Düsseldorf, Germany) stent were chosen. After stent implantation, bilateral venous backflow (*Figure 1, C*, and *Video 3*) was restored completely. One day after the intervention, a conventional dual-chamber pacemaker system providing atrioventricular synchronization was reimplanted via the right subclavian vein passing through the vena cava stent (denoted by → in *Figure 1, D*). Symptoms

FIGURE 1. In a 66-year-old woman with progressive bilateral arm and facial swelling following pacemaker implantation 12 years earlier, computed tomography angiography (A) showed a high grade stenosis of the superior vena cava (SVC) (→) and a total occlusion of the left brachiocephalic vein (LBV) along the course of the pacemaker leads (Δ). Venous angiography (B) revealed a prominent collateral flow via the azygos vein system (*) and a restored venous backflow (C) after successful recanalization with bifurcation venous stenting of the SVC and the LBV. After successful reimplantation of the pacemaker system via the right subclavian vein, computed tomography (D) showed the pacemaker leads passing through the stented segment of the SVC.

disappeared immediately, the patient was put on an oral anticoagulation therapy, and discharged 2 days later. In a follow-up visit to our outpatient clinic 3 months postintervention, both clinical symptoms and duplex-ultrasound signs of SVCS continued to be absent. Ethics committee approval for publication of this clinical case was received.

While malignancies account for the majority of SVCS, symptomatic postthrombotic obstruction of the SVC induced by pacemaker leads are rare, with a reported

incidence $<0.1\%$.^{1,2} Although in the upper extremity the ability to develop sufficient venous collaterals is high, yet in some cases severe symptomatic SVCS might develop. Endovascular is the first-line treatment option for SVCS caused by intravenous devices such as pacemaker leads, resulting in primary patency rates of around 70% after 12 months and 50% after 36 months.³ Endovascular revascularization and bifurcation venous stenting therefore provides a promising therapeutic option, especially in such challenging cases.

VIDEO 1. Transfemoral injection confirms high grade superior vena cava stenosis. Video available at: [https://www.jtcvs.org/article/S2666-2507\(20\)30536-8/fulltext](https://www.jtcvs.org/article/S2666-2507(20)30536-8/fulltext).

VIDEO 3. Restored venous backflow after successful percutaneous intervention. Video available at: [https://www.jtcvs.org/article/S2666-2507\(20\)30536-8/fulltext](https://www.jtcvs.org/article/S2666-2507(20)30536-8/fulltext).

VIDEO 2. Venous angiography with injection through the brachial vein reveals total occlusion of the left brachiocephalic vein with prominent collateral flow via the azygos vein system. Video available at: [https://www.jtcvs.org/article/S2666-2507\(20\)30536-8/fulltext](https://www.jtcvs.org/article/S2666-2507(20)30536-8/fulltext).

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