Rescue-stenting of an occluded lateral coronary sinus branch for recanalization after dissection during cardiac resynchronization device implantation

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Cardiac resynchronization therapy (CRT) using left- (LV) or biventricular pacing is widely applied in selected heart failure patients. However, transvenous LV-lead placement into coronary sinus (CS) branches can be challenging. A 77-year-old female patient with New York Heart Association class III symptoms due to dilated cardiomyopathy [LV ejection fraction (LVEF): 10%, QRS-duration: 150 ms], despite optimal medical treatment presented for CRT. Coronary sinus angiograms were performed after transvenous CS cannulation. Within a large posterolateral vein, low phrenic nerve stimulation thresholds were found. The only alternative smaller tortuous lateral branch showed a significant narrowing, making LV-lead advancement impossible. Angioplasty was performed, using a venoplasty balloon. This caused complete branch occlusion. After recanalization of the vessel by implantation of a bare metal stent, the lead could be advanced through the stent. Optimal pacing parameters without phrenic nerve stimulation were established. Angioplasty of CS branches during CRT implantation procedures bears the risk of complete branch occlusion, but recanalization can acutely be achieved by stent implantation. This is the first report on rescue-stenting of a CS branch after angioplasty-related occlusion. Trans-thoracic lead implantation, accompanied risks, and slower recovery could thus be avoided.

KEYWORDS
Resynchronization therapy; Left ventricular lead implantation; Stenting; Coronary sinus occlusion; Heart failure

Introduction
Cardiac resynchronization therapy (CRT) using left- (LV) or biventricular pacing is widely applied in the treatment of chronic heart failure patients with New York Heart Association (NYHA) class III or IV symptoms, LV ejection fraction (LVEF) of ≤35% and left bundle branch block. However, LV-lead placement via the transvenous approach can be challenging in the case of low phrenic nerve stimulation thresholds and/or inability to reach adequate coronary sinus (CS) branches. We report on a patient in whom the implantation procedure was complicated by both phrenic nerve stimulation and inability to reach the second acceptable posterolateral CS branch.

Case report
A 77-year-old female patient was admitted for CRT-device implantation. She presented with NYHA class III symptoms, despite optimal medical therapy, severely reduced LV systolic function (LVEF: 10%), LV dyssynchrony, and left bundle branch block with a QRS-duration of 150 ms.

Procedure
For transvenous implantation of the LV-pacing lead, a deflectable sheath (Attain Deflectable Catheter 6226 DEF, Medtronic, MN, USA) was advanced through the left subclavian vein and introduced into the CS. Figure 1A–D shows CS angiograms. Two branches leading to an optimal pacing position in the posterolateral region are illustrated. The LV lead was initially placed into the larger proximal posterolateral vein by over-the-wire technique. However, phrenic nerve stimulation thresholds were found below the LV pacing thresholds over the whole length of the vessel, thus requiring repositioning. The alternative tortuous lateral target vein showed a smaller diameter and a significant stenosis (Figure 1C and D), making LV-lead advancement impossible (Figure 2A). Since no further alternative branch was available for lead implantation, angioplasty of the stenosis was performed (Figure 2B), using a venoplasty balloon (VIVA, 3.0 × 20 mm,
Boston Scientific, Natick, USA, inflation pressure 10 bar, duration 30 s). Despite the before-mentioned intervention, the branch remained completely occluded, due to dissection (Figure 2C). As the guidewire remained in the targeted vessel immediate recanalization of the vessel could be achieved by implantation of a bare metal stent (Sonic, 3,0 × 33 mm; Cordis, Miami Lakes, USA; Figure 3A). Venography after stent implantation is shown in Figure 3A. The pacing lead could be advanced through the stent. And an optimal pacing position without phrenic nerve stimulation (Figure 3B) could be established. During 1-year follow-up, the LV pacing thresholds and impedance remained stable.
Discussion

Angioplasty and stent implantation in order to treat stenotic areas in targeted CS branches or for lead stabilization have been reported to be effective without major complications. However, stents may lead to insulation defects of pacing leads. Moreover, lead extractions in the case of later infections could be problematic. We report on rescue-stenting of an occluded CS branch after dissection during a CRT device implantation procedure. This complication was caused by angioplasty using a balloon, which retrospectively appeared oversized. In our case, pacing thresholds and impedance were stable without any signs of lead malfunction, e.g., insulation alterations. Furthermore, NYHA state improved by one class. The interventional approach avoided LV-lead placement via lateral thoracotomy, which again would have been accompanied by possible procedural risks, slower recovery and the risk of poorer long-term performance of the CRT system in terms of lead dislodgement, loss of capture, and reduced effects on heart failure parameters.

Conclusion

Angioplasty of CS branches during implantation of CRT systems bears the risk of complete occlusion of the treated branch, but recanalization can acutely be achieved by stent implantation. Transthoracic implantation of LV leads can thus be avoided. No complications occurred acutely and during 1-year follow-up.

References