Lead extraction complicated by right ventricular pseudoaneurysm: Percutaneous closure with septal occluder device

Matthew J. Singleton, MD, MBE, MHS, MSc, FIT-HRS,* Ryan Brunetti, MD,* Mark H. Schoenfeld, MD, FHRS, CCDS,† Prashant D. Bhave, MD, FHRS,* David X. Zhao, MD,* S. Patrick Whalen, MD, FHRS*

*From the *Section of Cardiology, Department of Internal Medicine, Wake Forest School of Medicine, Winston-Salem, North Carolina, and †Yale University School of Medicine, New Haven, Connecticut.*

Introduction

With the steady increase in the prevalence of transvenous cardiac rhythm maintenance devices in the general population, the number of patients requiring lead extraction has grown proportionately.[1] Though advances in the tools and techniques used for transvenous lead extraction have decreased the procedural morbidity, there remains a small but significant risk of catastrophic outcomes.[2–5] We describe a novel, percutaneous approach to management of a complication that would otherwise require sternotomy.

KEY TEACHING POINTS

- Right ventricular pseudoaneurysm is a known complication of transvenous lead extraction.
- Ventricular pseudoaneurysms portend a poor prognosis and have traditionally required operative repair.
- Percutaneous closure of pseudoaneurysm with a ventricular septal occluder device was clinically and radiographically successful.

Case report

A 78-year-old man with a secondary-prevention implantable cardioverter-defibrillator for history of ventricular tachycardia and high-grade atrioventricular block, as well as a recalled right ventricular (RV) lead (St. Jude Medical Riata 1580 [St. Paul, MN], 16-year dwell time) and pulse generator at elective replacement, was referred for pulse generator change and lead extraction. He had no prior cardiac surgery. Preoperative fluoroscopy demonstrated RV lead cable externalization at multiple locations. A 14F GlideLight (Spectranetics, Colorado Springs, CO) laser sheath was employed, but it would not progress beyond the distal coil. Ultimately, a 13F TightRail (Spectranetics) and counter-traction were used to liberate the lead (Supplemental Figure 1). Twenty minutes after completion of the extraction and removal of the transesophageal echocardiography probe, the patient became acutely hypotensive, requiring escalating pressor doses and subsequently a brief period of cardiopulmonary resuscitation. Bedside echocardiogram demonstrated pericardial effusion with tamponade physiology. Emergent pericardiocentesis produced 300 mL of bloody fluid and normalization of blood pressure. His hospital course was complicated by a cardioembolic stroke and a large left-sided pleural effusion.

Two weeks later, he was readmitted for dyspnea and chest pain in the setting of recurrent left-sided pleural effusions,

Figure 1 Coronal reconstruction of computed tomographic scan prior to closure demonstrating right ventricular (RV) pseudoaneurysm emerging from the RV apex with a narrow neck, filling with contrast.

KEYWORDS Complication; Lead extraction; Occluder; Percutaneous; Pseudoaneurysm; Right ventricle
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Address reprint requests and correspondence: Dr Matthew J. Singleton, Wake Forest School of Medicine, 1 Medical Center Blvd, Winston-Salem, NC 27157. E-mail address: mjsingle@wakehealth.edu.

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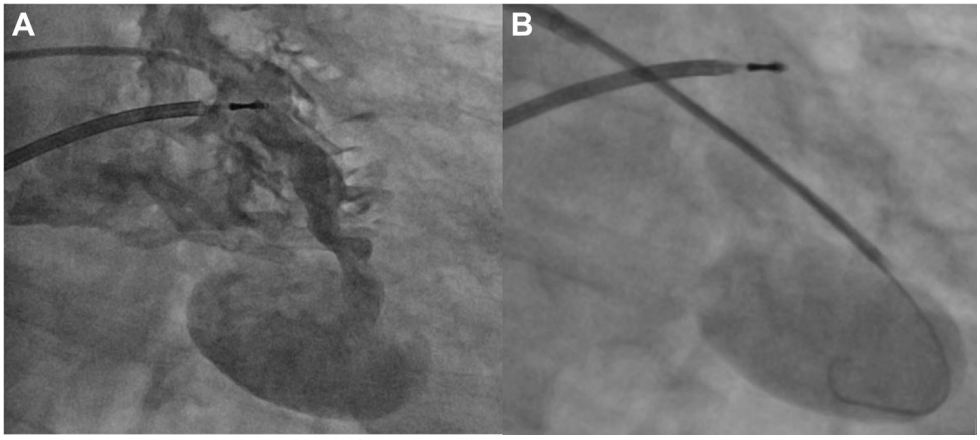

Figure 2 **A:** Fluoroscopic view of contrast filling right ventricular pseudoaneurysm. **B:** J-tip wire in place prior to deployment of ventricular septal occluder device.

which were attributed to congestive heart failure, trauma from chest compressions, and ongoing oral anticoagulation. He required repeated thoracenteses, each producing 1 L of bloody fluid, and a pleural drainage system was placed. Computed tomography of the chest demonstrated an RV apical pseudoaneurysm that measured 4.6 × 2.3 × 6.1 cm with a 7-mm neck (Figure 1). Anticoagulation was indicated, given atrial fibrillation and a history of cardioembolic stroke, but there was substantial concern about the risk of pseudoaneurysm expansion and rupture with anticoagulation. Cardiothoracic Surgery consulted for consideration of operative repair but judged the patient to have prohibitive operative risk, so percutaneous treatment was pursued.

In the cardiac catheterization laboratory, right femoral venous access was obtained. Right ventriculography demonstrated the apical pseudoaneurysm (Figure 2A) filling briskly (Video 1). A j-tip wire (0.052 inch) was advanced into the pseudoaneurysm and position was confirmed by fluoroscopy (Figure 2B) and transesophageal echocardiography. A St. Jude Medical 8-mm Amplatzer ventricular septal defect occluder device was successfully deployed into the RV pseudoaneurysm, with postdeployment angiography demonstrating excellent device position (Supplemental Figure 2) with no residual flow across the neck of the pseudoaneurysm (Video 2). Repeat imaging 2 months later confirmed stability of the device and continued exclusion of the pseudoaneurysm (Figure 3).

Figure 3 Coronal reconstruction of computed tomographic scan 2 months post-closure demonstrating obliteration of right ventricular (RV) pseudoaneurysm with radiodense septal occluder device visualized at the RV apex, where the pseudoaneurysm neck was previously.

Discussion

RV pseudoaneurysm formation is a rare complication of lead extraction.[6] In general, ventricular pseudoaneurysms portend a poor prognosis if managed conservatively and have traditionally required operative management.[7–9] Prior studies have demonstrated the heightened risk of thromboembolism and ventricular free wall rupture when ventricular pseudoaneurysms are not surgically managed, with annual rupture rates of 30%–45%.[10,11] In patients who are not operative candidates, there have been several explorations into the possibility of percutaneous closure, with varying success.[12,13] Though the data on prognosis and management of left ventricular pseudoaneurysms are sparse, even less data are available on RV pseudoaneurysms, leaving uncertainty in the optimal management strategy.

This patient had an RV pseudoaneurysm, which would traditionally be treated with open surgical aneurysmectomy, but his active comorbidities conferred prohibitive operative risk. Therefore an alternative option was required, and percutaneous treatment offered a less invasive solution. It should be noted that relationships of the pseudoaneurysm to adjacent cardiac structures, such as the valve annulus, outflow tract, and epicardial vessel, can limit percutaneous closure options.[14]

Our case illustrates the importance of collaborative clinical care, involving cardiac electrophysiology, cardiac surgery, and interventional cardiology. The patient tolerated deployment of the septal occluder device and demonstrated both clinical and radiographic success. He has had no further sequelae of his RV pseudoaneurysm and is doing well clinically.

Conclusion

We report successful percutaneous treatment of an RV pseudoaneurysm with a ventricular septal occluder device, with radiographically confirmed closure. As lead extractions become more and more common, percutaneous closure and other advanced techniques for treating downstream complications, such as iatrogenic ventricular pseudoaneurysms, may become increasingly relevant.

Appendix

Supplementary data

Supplementary data associated with this article can be found in the online version at https://doi.org/10.1016/j.hrcr.2019.08.007.

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