Shearing of the sheaths: A case illustrating a rare complication of catheter ablation

Vivek Reddy, MD,* Satwant Mangat, MD,† Mohamed Shokr, MD,‡ Melanie Schwiesow, MD,§ Mazhar Khan, MD‖

*From the *WSU/DMC Department of Cardiology, Harper Hospital, Detroit, Michigan, †Department of Internal Medicine, DMC Sinai Grace, Detroit, Michigan, ‡Department of Cardiac Electrophysiology, NYU College of Medicine, New York, New York, §Department of Vascular Surgery, DMC Cardiovascular Institute, Detroit, Michigan, and ‖Department of Cardiac Electrophysiology, DMC Cardiovascular Institute, Detroit, Michigan.*

Introduction

Electrophysiology studies and catheter ablations are rarely associated with complications including but not limited to vascular access complications, pericardial tamponade, infections, and recurrent arrhythmias.[1] In this report we present a rare complication associated with closed-loop large catheters resulting in shearing of a large sheath.

Case report

The case involves a 35-year-old man with a medical history significant for nonischemic cardiomyopathy with a dual-chamber implantable cardioverter-defibrillator, history of infective endocarditis with a bioprosthetic mitral valve replacement, and tricuspid valve annuloplasty for infective endocarditis. Other significant medical history included previous typical atrial flutter status post ablation with recurrence. The patient presented to the electrophysiology laboratory for an ablation of suspected recurrent atypical atrial flutter.

During the electrophysiology study a Bard decapolar and a quadripolar His catheter were advanced through 2 7F sheaths placed in the left femoral vein to the coronary sinus and His bundle location, respectively. Through the right femoral vein, a St. Jude ICE catheter via a 10F short sheath, St. Jude HD grid mapping catheter via short 8F sheath, and St. Jude ablation catheter via a long St. Jude SR0 sheath were advanced into the right atrium.

Findings during the electrophysiology study revealed typical atrial flutter. The tachycardia was entrained, confirming the mechanism of re-entry, and 2 atrial flutter ablation lines were performed at the isthmocaval junction and normal sinus rhythm was obtained. At the conclusion of the procedure, catheters were withdrawn and the HD grid catheter was pulled back under fluoroscopic guidance. Some resistance was noted proximally in the inferior vena cava, however, when the HD grid catheter was withdrawn. Fluoroscopy as shown in Figure 1 illustrates the HD grid catheter wrapping around the long SR0 sheath. A manual tug was performed on the HD grid catheter under fluoroscopy, although the HD grid catheter and distal end of the SR0 sheath was not visualized in this process. This allowed the HD grid catheter to come out; however, in the process the SR0 sheath was severed in the middle aspect of the sheath and removed from the body as well. The presumed mechanism was the closed-loop catheter impaling the SR0 sheath. A subsequent fluoroscopy image showing the free-floating SR0 sheath is shown in Figure 2. The large SR0 sheath was successfully snared and removed without complications, as noted in Supplemental Video 1. After the SR0 sheath was removed,

KEY TEACHING POINTS

- Large closed-loop catheters such as the HD grid mapping catheter have the risk of impaling and severing other sheaths.
- When resistance is noted with withdrawing closed-loop catheters, it is advisable to use fluoroscopy at the site of resistance and proximally in addition to advancing the catheter, rather than withdrawing under fluoroscopy.
- It may be advisable to advance closed-loop catheters using a long sheath or to remove other sheaths first prior to withdrawing a closed-loop catheter.

KEYWORDS Catheter ablation; Closed-loop catheters; Complications; Mapping; Shearing
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Figure 1 The HD grid mapping catheter has impaled and wrapped around the long SR0 sheath.

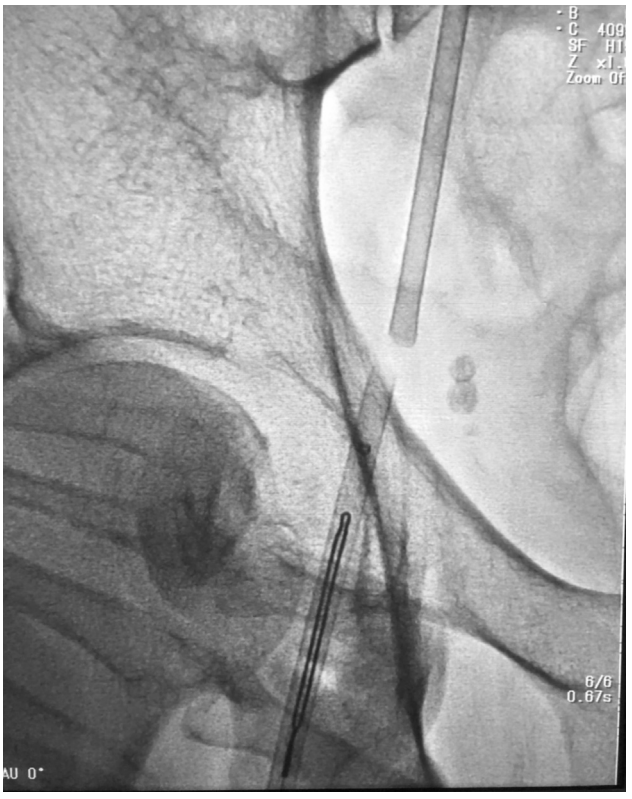

Figure 2 After manual force the HD grid mapping catheter was removed with shearing the middle of the SR0 sheath.

examination of the cut end revealed a clean appearance consistent with a uniform tearing force. No other complications were noted during the procedure or the remainder of the hospital course, and the patient was subsequently discharged with outpatient follow-up.

Discussion

In this case, we observed a rare complication that has not been reported to have occurred in this manner. This case shows the importance of recognizing resistance during removal of a large, closed-loop catheter. The potential for the closed loop to sever a long sheath needs to be considered, especially if resistance is encountered. The presumed mechanism of the shearing of the SR0 sheath was due to the closed-loop nature of the HD grid catheter that wrapped around the SR0 sheath. It is important to note that during the removal of the HD grid catheter resistance was noted; however, the catheter was still removed with some manual force. Given this outcome, it is advisable that if such resistance is noted, fluoroscopy or cine imaging should be performed at the site of resistance and proximally. In addition, it is advisable to advance the catheter under fluoroscopy rather than to continue to apply manual traction force. Another alternative to avoid this complication may be to remove long and short sheaths first (when feasible) prior to removing the closed-loop catheters such as the HD grid catheter. Lastly, advancing closed-loop catheters such as the HD grid catheter through a long sheath would provide additional support for the catheter and likely prevent any impaling of the closed-loop catheter with other sheaths.

Our case describes a rare complication of large closed-loop catheters that has not been reported to have occurred in this manner. We hope that our experience from this case has provided useful clinical information for other electrophysiologists and for future cases.

Appendix

Supplementary data

Supplementary data associated with this article can be found in the online version at https://doi.org/10.1016/j.hrcr.2021.03.024.

Reference

1. Gupta A, Perera T, Ganesan A, et al. Complications of catheter ablation of atrial fibrillation: a systematic review. Circ Arrhythm Electrophysiol 2013;6:1082–1088.