Cardiovascular Revascularization Medicine 20 (2019) 94–95

Contents lists available at ScienceDirect

Cardiovascular Revascularization Medicine

Advances in Vascular Post-Closure With Impella☆

The use of acute mechanical circulatory support (AMCS) devices is growing [1]. Applications include cardiogenic shock and high-risk coronary, valvular, and electrophysiologic interventions. While most reports in this field focus on hemodynamic effects, myocardial recovery, and end-organ function, one of the most important determinants of clinical outcomes is associated with adverse vascular events (AVEs). AVEs can be broadly categorized into four phases: at the time of insertion, while on mechanical support, at the time of device removal, or after device removal. Each of these AVEs is also unique to the type of AMCS being employed.

A recent analysis of more than 1800 percutaneous left ventricular assist device implants identified that hematoma, transfusion, and re-intervention occurred in 10.1%, 17%, and 2.6% of cases respectively [2]. These findings are likely magnified when focused on all AMCS platforms, including veno-arterial extracorporeal membrane oxygenation (VA-ECMO), TandemHeart support, and Impella. Furthermore, cardiogenic shock patients are especially prone to vascular complications caused by multi-organ failure, coagulation disorders, use of vasopressors, and insertion of AMCS devices under emergent conditions. Other factors likely to influence AVEs include age, peripheral vascular disease, obesity, and prior vascular intervention [3].

In this issue of *Cardiovascular Revascularization Medicine*, Omran and Reeves report 2 approaches to remove an Impella CP or 2.5 pump while preserving arterial access [4]. One approach involves cutting the catheter shaft and inserting telescoping 9Fr/12Fr sheaths over the catheter shaft, which allows for rewiring of the descending aorta and subsequent removal of the Impella while preserving wire access in the aorta for introduction of a new 14Fr sheath. The second approach is bit more heroic and involves partially exposing the outlet port of the Impella cannula (i.e., Impella cannula half in and half out of the femoral artery) and rewiring this cannula with a stiff wire to re-access the aorta. Both techniques worked in these cases but are the types of approaches that we as interventionalists often put together as a bailout maneuver. These approaches sometimes work and often lead to important advances in technology that are more optimally designed to address the issue.

Since publication of this report, newer-generation Impella CP devices are equipped with a side-arm access port to facilitate re-wiring into the vascular lumen (Fig. 1). A stylet is removed from the side arm and a 0.035" wire can be advanced through the repositioning sheath into the true vascular lumen. Once a wire is positioned in the aorta, the entire Impella CP device can be removed with the repositioning sheath while maintaining aortic wire access and manual compression for hemostasis. We then insert a new 14Fr sheath followed by either insertion of a new CP device or closure of the 14Fr arteriotomy. Most commonly, we deliver 0.035" wires through the 14Fr sheath and, using a 7Fr dilator on one wire, deliver a Perclose (Abbott Inc.) suture at 10:00 followed by a second suture at 2:00 and, if needed, a third suture at 12:00. Others have described regaining access via the contralateral femoral artery for dry closure [5] or delivery of Perclose sutures without the buddy wire/buddy dilator approach. These procedures should be performed under fluoroscopic guidance with documented angiography or other vascular imaging to confirm vessel size, patency, and optimal location of the primary arteriotomy in the common femoral artery.

Unlike transcatheter aortic valve replacement or other procedures involving large-bore access, AMCS devices often indwell for days or weeks and may involve combinations of devices, such as Impella with VA-ECMO. Most VA-ECMO circuits require 15Fr to 19Fr arterial cannulas and are often deployed with an antegrade perfusion sheath. Closure of these cannulas is most commonly achieved with femoral cut-down and primary surgical repair of the artery. As we continue to operate and deploy AMCS devices, new options to deal with potential AVEs will likely improve clinical outcomes for this critically ill population.

References

[1] Stretch R, Sauer CM, Yuh DD, Bonde P. National trends in the utilization of short-term mechanical circulatory support: incidence, outcomes, and cost analysis. J Am Coll Cardiol 2014;64(14):1407–15.
[2] Redfors B, Watson BM, McAndrew T, Palisaitis E, Francese DP, Razavi M, et al. Mortality, Length of Stay, and Cost Implications of Procedural Bleeding After Percutaneous Interventions Using Large-Bore Catheters. JAMA Cardiol 2017;2(7):798–802.
[3] Dencker D, Pedersen F, Engstrøm T, Køber L, Højberg S, Nielsen MB, et al. Major femoral vascular access complications after coronary diagnostic and interventional procedures: A Danish register study. Int J Cardiol 2016;202:604–8.
[4] Omran, Reeves. Techniques of Impella Removal While Preserving Arterial Access. Cardiovasc Revasc Med 2019;20(2):167–70.
[5] Kaki A, Blank N, Alraies MC, Kajy M, Grines CL, Hasan R, et al. Access and closure management of large bore femoral arterial access. J Interv Cardiol 2018;31(6):969–77.

Navin K. Kapur*
Colin Hirst
David Zisa
The CardioVascular Center, Tufts Medical Center, Boston, MA
*Corresponding author.
E-mail address: Nkapur@tuftsmedicalcenter.org

☆ Disclosures: Dr. Kapur has received research funding from Abiomed Inc. (Danvers, Massachusetts), Boston Scientific (Minneapolis, MN), CardiacAssist Inc. (Pittsburgh, Pennsylvania), and Maquet Cardiovascular Inc. (Rastatt, Germany).

https://doi.org/10.1016/j.carrev.2019.01.016
1553-8389/

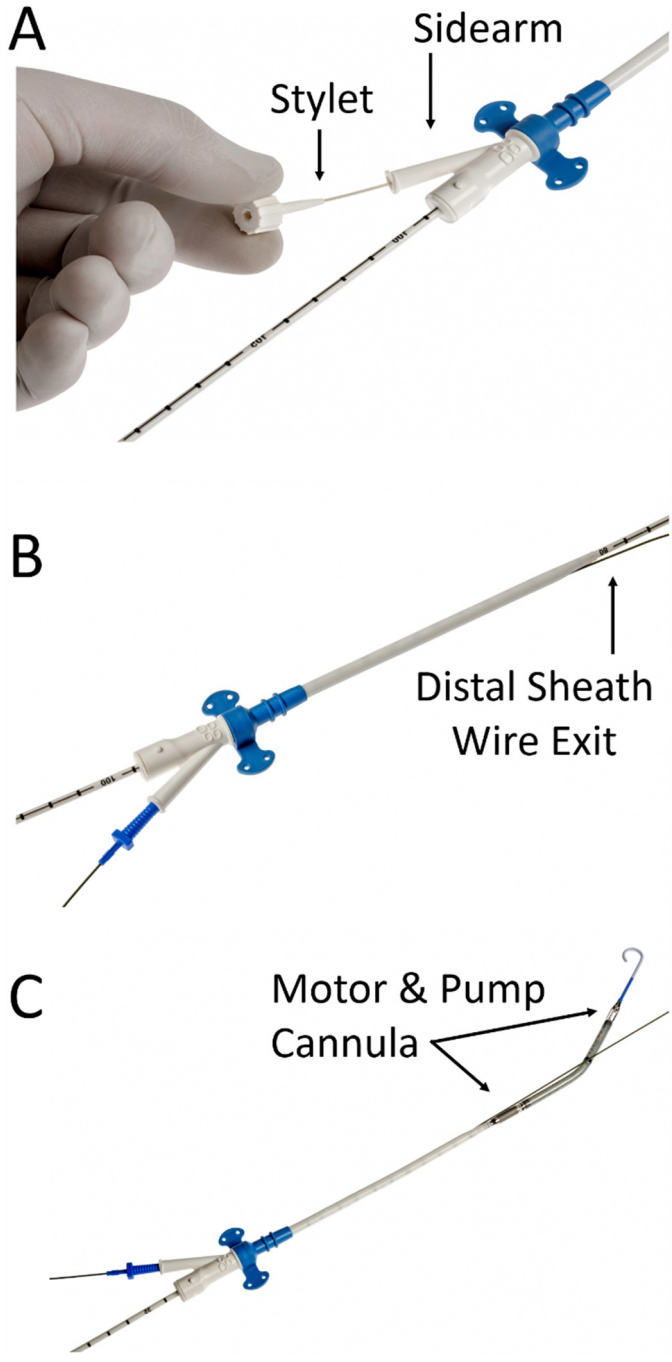

Fig. 1. Newer-Generation Impella Re-wiring Sheath for Post-Closure. A) Stylet is removed from the side arm of the repositioning sheath, B) A 0.035" wire can be inserted into the sidearm and exits the distal end of the repositioning sheath into the vascular lumen adjacent to the Impella catheter shaft, C) The Impella is pulled toward the repositioning sheath until the motor and cannula are positioned outside the repositioning sheath with the 0.035" wire in the aorta. The Impella and repositioning sheath can then be removed en bloc and the 0.035" wire left in the aorta for re-access.