To the Editor,

Impella (Abiomed, Inc. Danvers Massachusetts) has become the dominant left ventricular assist device (LVAD). It is a catheter based percutaneous axial flow pump that is more easily inserted compared to other support devices, which require surgical implantation [1, 2]. Furthermore, it has been shown to provide better hemodynamic support compared to intra-aortic balloon pump [1, 2]. As the role of the device is expanding, so are the guidelines with current recommended uses including high risk percutaneous intervention (PCI), acutely decompensated heart failure, temporary support for patients with multiorgan failure, bridge to recovery or bridge to decision for patients with acute, profound hemodynamic compromise, ST elevation MI (STEMI) and urgent coronary artery bypass grafting (CABG), and cardiogenic shock [3, 4, 5]. However, there are known complications with Impella including bleeding, particularly in the setting of coagulopathy and anticoagulation. In this setting, when the Impella is ready to be removed, it is desirable to remove the device without removing the large arterial access sheath to allow for correction of coagulopathy or reversal of anticoagulation in order to minimize vascular complications. Unfortunately, the current Impella system does not allow for retaining the arterial access sheath while removing the device. Here we describe two cases where a novel method was used to exchange an Impella over a guide-wire, preserving the arteriotomy access to lower the risks of vascular complications.

**Highlights**

We describe a novel technique to exchange an Impella over a guide-wire, preserving the arteriotomy access and to lower the risks of vascular complications. We describe this technique in the context of two interesting cases. The first case is of a young man with myocarditis and cardiogenic shock from a previously undiagnosed systemic lupus erythematosus. The second case is of a woman with ST elevation myocardial infarction and cardiogenic shock requiring complex percutaneous intervention. The implantation of Impella CP served as circulatory support in these cases as myocardium recovered but was complicated by access site bleeding. We were able to remove the Impella device while maintaining the access sheath to allow for adequate hemostasis prior to sheath removal. We believe the readers of the journal will find these images and technique interesting and useful in their own practice.

**Keywords:** Ventricular assist pump; Impella Removal technique

A new sheath can be introduced through the same access site over the wire. (Figure 2B) A higher gauge wire may be exchanged for the 0.18" wire using a dilator.

The first case description is of a 17 year old man with history of asthma, obesity, and deep venous thrombosis presenting with progressive worsening chest pain. His symptoms started about four weeks prior when he was hospitalized for uremia. There was associated progressive dyspnea on exertion. In the emergency room the patient was found to have worsening renal function and hypoxic respiratory failure requiring intubation. Chest computed tomography angiography demonstrated diffuse ground-glass opacities but no pulmonary embolism. The patient was admitted to the pediatric intensive care unit and had cardiac arrest shortly thereafter. The underlying rhythm was pulseless electrical activity followed by ventricular fibrillation and was successfully resuscitated. Subsequent transthoracic echocardiogram (TTE) demonstrated global right and left ventricular (LV) dysfunction and an ejection fraction (EF) of about 25%. He was started on inotropic therapy for hemodynamic support and continuous renal replacement therapy. He was subsequently diagnosed with systemic lupus erythematosus and myocarditis confirmed by endomyocardial biopsy. Immunosuppressive therapy and plasmapheresis were initiated. An Impella CP circulatory support device was inserted using the femoral artery which was complicated by slow but constant access site bleeding one day after insertion requiring transfusions. Temporary measures including termination of anticoagulation and application of Femostop were not successful in achieving hemostasis. Given improved hemodynamics and the ongoing bleeding, the Impella was removed using the technique described above. The vascular access sheath was removed without further bleeding or complications after hemostasis was achieved and partial prothrombin time normalized.

The second case is of a 61 year old woman with history of hypertension, diabetes mellitus type 2, and prior left anterior descending (LAD) stent placement. She presented to an outside hospital with ST elevation myocardial infarction and cardiogenic shock. Percutaneous intervention (PCI) of a 95% LAD in-stent restenosis was attempted at that facility without success. An intra-aortic balloon pump was placed through the right femoral artery and she was intubated for hypoxic respiratory failure prior to her transfer to our facility for a second attempt at PCI of the LAD. She was subsequently taken for coronary angiography and was noted to have a 95% mid LAD stenosis, 90% proximal right coronary artery (RCA) stenosis, and a 90% mid RCA stenosis. The intra-aortic balloon pump was exchanged for an Impella CP for circulatory support in preparation for complex PCI. The three lesions were successfully stented and patient was admitted to cardiac intensive care unit for further care. TTE demonstrated severe LV dysfunction with EF of 20%. On hospital day two, the patient developed bleeding from the Impella vascular access site with mild drop in hemoglobin concentration. She did not require transfusions. Temporary measures including termination of anticoagulation and application of a Femostop were not successful in achieving hemostasis. Given improved hemodynamics and the ongoing bleeding, the Impella was removed using the technique described above. The vascular access sheath was removed without further bleeding or complications after hemostasis was achieved and partial prothrombin time normalized.

Figure 1. Create a cut at position 40cm and position 105cm on the Impella catheter (A). Back-load a 0.18 J-tipped wire so that it exits at position 105cm (B).

Figure 2. Once the Impella is advanced to position 60cm, the wire is advanced into the vessel lumen and the Impella and the sheath are removed retaining the wire (A). A new sheath can then be used to maintain hemostasis or exchange for other devices (B).
The Impella design using the current hemostatic sheath does not provide options to preserve the arterial access upon removal of the device. We propose a novel method to exchange an Impella over a guide-wire, preserving the arteriotomy access to lower the risks of vascular complications. Both described cases demonstrate the successful utilization of this technique with good results.

Declarations of Interest
The authors declare no conflicts of interest.

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References