



## Case Report

# Fill Two Needs With One Deed! Single-Access Protected Percutaneous Coronary Intervention With Impella Hemodynamic Support

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### ABSTRACT

This report describes the case of a 64-year-old man who presented with acute coronary syndrome, depressed left ventricular function, and triple vessel disease on angiogram. The patient refused surgery and underwent high-risk percutaneous coronary intervention through the Impella sheath (Abiomed, Danvers, MA). This is one of the first known cases of single-access protected percutaneous coronary intervention, an innovative technique that brings into consideration the importance of dual vascular access via the Impella sheath.

### RÉSUMÉ

Les auteurs décrivent le cas d'un homme âgé de 64 ans présentant un syndrome coronarien aigu, une fonction ventriculaire gauche réduite et une triple vasculopathie à l'angiogramme. Le patient a refusé une intervention chirurgicale et a plutôt subi une intervention coronarienne percutanée hautement risquée, réalisée au moyen d'une gaine Impella (Abiomed, Danvers, MA). Il s'agit de l'un des premiers cas connus d'intervention coronarienne percutanée protégée à accès unique, une technique novatrice qui met en lumière l'utilité d'un accès vasculaire double grâce à une gaine Impella.

A 64-year-old man with a history of hypertension, uncontrolled type II diabetes, bowel obstruction, and mesh repair of an incarcerated ventral hernia 1 month ago presented with acute-onset chest pain. Electrocardiogram showed new T-wave inversions in leads V3 to V5. Troponins trended up to 12.3 ng/dL within 6 hours. Management of non-ST-elevation myocardial infarction was started. Echocardiogram showed depressed left ventricular systolic function with an ejection fraction of 30% with diffuse left ventricular hypokinesis. Coronary angiography revealed 90% stenosis of the proximal left anterior descending artery, 80% stenosis of the mid left circumflex artery, chronic total occlusion of the right coronary artery, and a SYNTAX score of 19. The patient opted against another surgery after a recent surgical experience. An interventional approach was contemplated after discussion with the heart team. Percutaneous coronary intervention (PCI) with Impella (Abiomed, Danvers, MA) support and angioplasty

through the Impella access sheath via a femoral approach were planned.

### Technique

A 14F access arterial sheath was introduced in the right femoral artery percutaneously. Over a 0.035" exchange wire, the inflow was advanced under fluoroscopy across the aortic valve and the device position was confirmed. Subsequently, a micropuncture access needle was used to pierce the hemostasis valve in the superolateral portion (2 o'clock) of the sheath, away from the central lumen with care to avoid piercing the Impella catheter. After exchanging for a 0.018" wire, a 6F sheath was introduced. Predilatation was avoided to prevent para-sheath leak. The guiding catheter was advanced under fluoroscopy, and the vessel was engaged ("sheath within a

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**Ethics Statement:** The research reported has adhered to the relevant ethical guidelines.

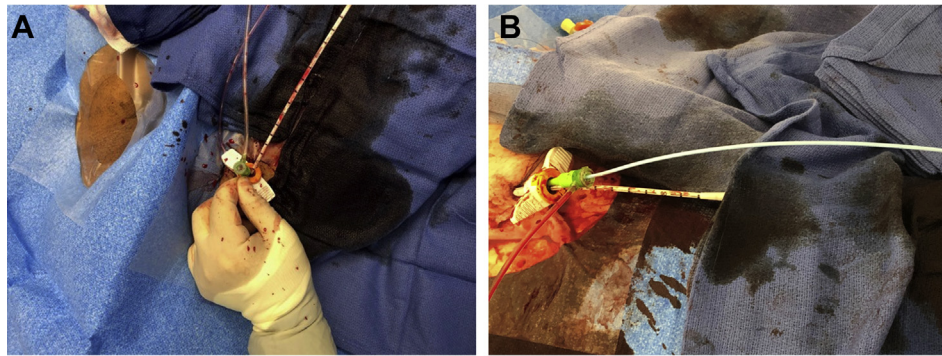
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See page 78 for disclosure information.

### Novel Teaching Points

- Our case demonstrates that in high-risk patients with coronary artery disease, PCI can be performed safely via the Impella system sheath.
- This strategy potentially avoids unnecessary access site cannulation and associated vascular complications.



**Figure 1.** (A) A 6F sheath introduced next to the Impella catheter into the 14F Impella sheath (Abiomed, Danvers, MA). (B) Filling 2 needs with 1 deed. Percutaneous coronary intervention (PCI) through the Impella sheath system.

sheath technique”) (Fig. 1A). Angioplasty with placement of a drug-eluting stent to the proximal left anterior descending artery and mid left circumflex artery stenosis was performed (Fig. 1B). After the PCI, the sheath was removed and the defect closed upon itself (Video 1 [📺](#), view video online). Subsequently, the Impella catheter was removed, and the arteriotomy was closed in the standard fashion. There was no bleeding, and the patient was returned to the recovery room in stable condition. There was no access site complication at 6 weeks and the 3-month follow-up visit.

## Discussion

Impella assist devices are considered in high-risk PCI, with complex coronary artery disease involving a large territory and severe left ventricular dysfunction.<sup>1</sup> Convincing evidence exists that the Impella device is able to offer effective hemodynamic support in terms of pressure and cardiac output, with the ability to achieve a more complete revascularization in supported patients and decreased need for repeat revascularization.<sup>2,3</sup> The Impella CP sheath has a diameter of 14F, for the 14F motor to get access, but the Impella CP catheter is 9F (further tapers down as per our experience), thus permitting enough room to put in another sheath to perform PCI through the same access.

We recommend the use of the micropuncture needle over the Seldinger needle because it is less likely to damage the Impella catheter. It is important to puncture the sheath diaphragm away from the central portion to maintain hemostasis and then the sheath inserted over a wire. If the sheath is simply advanced into the insertion sheath, there will be bleeding because the valve cannot form a tight seal around both the Impella catheter and the PCI sheath. Needle stick should be parallel to the Impella catheter rather than angulated (as with the general approach for a femoral stick) to decrease the risk of damage to the Impella catheter. While advancing the sheath, the Impella catheter should be held to avoid dislodgement. Ideally, an iliac arteriogram should be performed before the procedure to ensure the iliac artery would be able to accommodate both catheters outside the sheath and avoid interaction.

Although a 6F × 10 cm sheath was used in this case, successful insertion of a 7.5F sheathless Eaucath catheter (Asahi Intecc Co., Ltd., Aichi, Japan) was performed by us in another patient. Wollmuth et al.<sup>4</sup> also reported using a

7F × 45 cm sheath with a 35-cm hydrophilic coating to improve the ease of insertion via the same technique. Potential limitations to the single-access technique include bleeding through the diaphragm, bleeding around the sheath, disruption of the integrity of the peel away introducer sheath, damage to the Impella catheter while taking the second access, interaction with the Impella catheter while there is manipulation with possible displacement, and lack of second access to deal with access site complications.

## Conclusion

Our case demonstrates that in high-risk coronary artery disease patients, PCI can be performed safely via the Impella sheath, therefore avoiding unnecessary vascular access and associated complications.

## Disclosures

The authors have no conflicts of interest to disclose.

## References

1. Rihal CS, Naidu SS, Givertz MM, et al. 2015 SCAI/ACC/HFSA/STS Clinical Expert Consensus Statement on the Use of Percutaneous Mechanical Circulatory Support Devices in Cardiovascular Care. *J Am Coll Cardiol* 2015;65:7-26.
2. Burzotta F, Paloscia L, Trani C, et al. Feasibility and long-term safety of elective Impella-assisted high-risk percutaneous coronary intervention: a pilot two-centre study. *J Cardiovasc Med (Hagerstown)* 2008;9:1004-10.
3. O'Neill WW, Kleiman NS, Moses J, et al. A prospective, randomized clinical trial of hemodynamic support with Impella 2.5 versus intra-aortic balloon pump in patients undergoing high-risk percutaneous coronary intervention: the PROTECT II study. *Circulation* 2012;126:1717-27.
4. Wollmuth J, Korngold E, Croce K, Pinto DS. The Single-access for Hi-risk PCI (SHIP) technique. *Catheter Cardiovasc Interv* 2019;1-3.

## Supplementary Material

To access the supplementary material accompanying this article, visit *CJC Open* at <https://www.cjopen.ca/> and at <https://doi.org/10.1016/j.cjco.2020.01.002>.