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Endovascular Retrieval of a Retained Temporary Ventricular Support Device

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Editor:

We report a case of endovascular removal of an Impella LP 2.5 left ventricular assist device (Abiomed, Danvers, Massachusetts) kinked in the aortic arch in a patient with cardiomyopathy undergoing percutaneous coronary intervention. This report was exempt from institutional review board approval.

The Impella is a newer left ventricular assist device used for prophylaxis against acute circulatory collapse during high-risk percutaneous interventions (1). It is a monorail-based Archimedean screw with a soft pigtail catheter distally that extends into the left ventricle. It functions as an ejector pump to assist left ventricular function during coronary intervention (**Fig 1**). The Impella device provides greater improvement in hemodynamics compared with intraaortic balloon pumps (1).

An 89-year-old man with a history significant for cardiomyopathy and three-vessel coronary artery disease, with a left ventricular ejection fraction of 20%, presented with myocardial infarction. His cardiologist planned coronary intervention with Impella device assistance.

Via a left femoral approach, the 14-F introducer sheath required for Impella device use was placed percutaneously. The Impella device was advanced to the ascending aorta over the requisite 0.018-inch wire, at which point the wire looped around the monorail entry point (**Fig 2**). Via left radial artery access with a 6-F sheath (Cook, Bloomington, Indiana), the wire was snared and pulled in an attempt to straighten the loop, which pulled the loop tighter. At this point, the cardiologist consulted the interventional radiology service for intraprocedural assistance. An attempt was made to pass a 45-cm, 8-F sheath (Cook) from the right groin, through the looped area, to allow a fulcrum to pull apart the loop. This was unsuccessful (**Fig 3**). The folded device had been pulled partially within the 14-F sheath in the shape of a number "7" and withdrawn to the left common iliac artery. The vascular surgery service was consulted for possible surgical extraction and artery repair, but the patient was deemed not suitable for surgery because of low ejection fraction.

It was decided to remove the Impella device by pulling it out of the left common femoral artery entrance site and immediately deploying a stent graft to seal the expected arterial rent. The right groin sheath was upsized to a 30-cm, 12-F sheath (Cook) to accommodate the stent graft. An 11-mm × 50-mm VIABAHN stent graft (W.L. Gore & Associates, Flagstaff, Arizona) was advanced over a 260-cm, 0.035-inch Amplatz wire (Boston Scientific, Marlborough, Massachusetts) positioned across the left common femoral arterial puncture site of the 14-F sheath. As the sheath and the folded Impella device were removed from the patient, the covered stent was

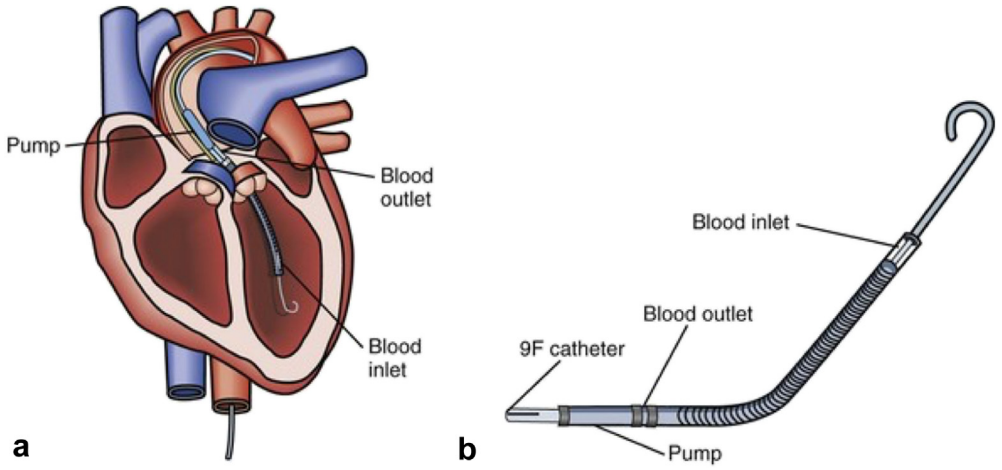

Figure 1. **(a)** Schematic illustration demonstrating placement of the Impella LP 2.5 device across the aortic valve. **(b)** Components of the device.

None of the authors have identified a conflict of interest.

Figure E1 is available online at *www.jvir.org*.

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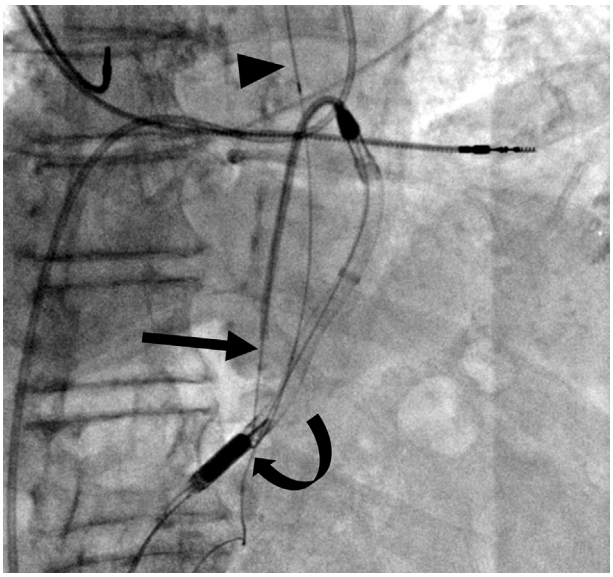

Figure 2. The requisite 0.018-inch bare metal wire enters the proximal monorail port (curved arrow). Distally, the wire exits the pigtail catheter and is kinked under the wire entrance point (straight arrow) and then extends superiorly (arrowhead).

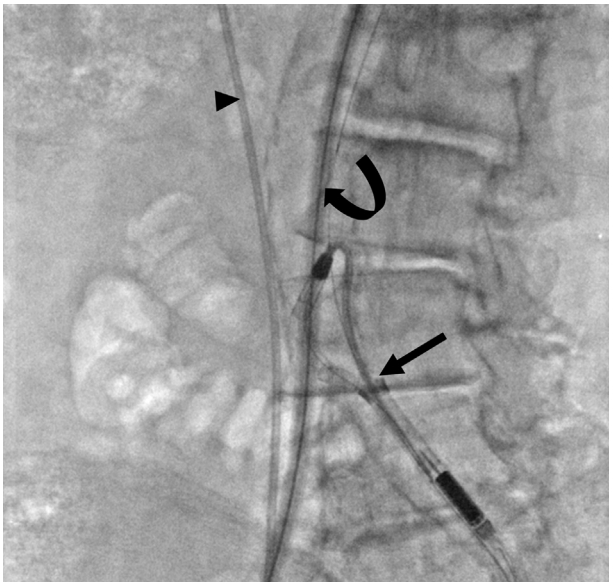

Figure 3. Kinked Impella device lodged in the sheath from the left groin (straight arrow). An 8-F sheath (curved arrow) is passed from the right groin through the loop of the kinked device. Right heart catheter is shown (arrowhead).

advanced forward and deployed. An angiogram demonstrated patency with no evidence of dissection or pseudoaneurysm (Fig E1). There was no bleeding from the left groin. The Impella device was recovered in its entirety and intact (Fig 4). The patient recovered from the procedure and was discharged from the hospital 2 days after the procedure. Despite the cardiology service's recommendation against repeat intervention, this was performed at another hospital, and the patient died during the procedure.

Several studies have investigated Impella device complication rates (2–4). Device displacement and infection

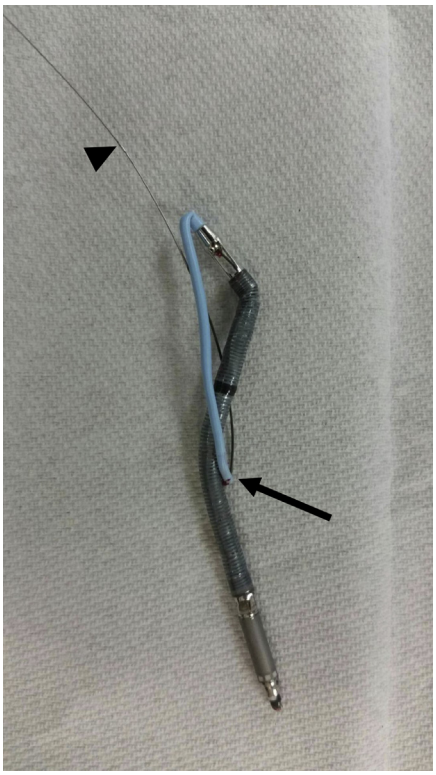

Figure 4. The extracted kinked Impella device, including the requisite 0.018-inch bare metal wire (arrowhead). Distally, the wire exits the pigtail catheter and is kinked under the wire entrance point (arrow).

were the most common complications noted. Some device failures were the result of driveline kinking. To our knowledge, Impella device kinking has not been reported to cause inability to remove the device. The fact that the device is relatively stiff and has a large diameter relative to the provided bare 0.018-inch monorail wire might make tracking through the arterial system problematic if the vessels are heavily calcified, as they were in the present case. The manufacturer has since released a kink-resistant modification for the Impella 5.0/LD device, which may make device malfunction less common.

The present report describes a case in which an Impella left ventricular assist device became kinked and entrapped in the heavily calcified aorta of an elderly patient who was not a candidate for surgical treatment. Carefully timed deployment of a stent graft allowed removal of the deformed device and arterial relining. This report may serve as a guide to other interventionalists who might be faced with entrapment of these increasingly popular devices.

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