of arterial deformity, atherosclerosis, or calcification, with liberal use of side grafts to artery.

Limited options were available to manage the intra-arterial decoupling of the Impella device. Because time was of the essence, we performed an emergency retrieval of the Impella pump segment in the operating room, where the setup and equipment for endovascular image-guided interventions are not optimal compared with a catheterization laboratory. Accordingly, a portable fluoroscopy C-arm x-ray machine was used to identify the device segment and “manually” follow the intervention. Surgical removal would have been the last resort considering the already precarious medical condition of the patient. Other conventional nonoperative alternatives for this endovascular foreign body retrieval consist of using snare catheters or graspers in a standard fluoroscopic/radiographic room. The key to safety for this type of procedure is fluoroguidance and transesophageal echocardiography monitoring, which were both available in our case.

CONCLUSIONS

We report a case of an intra-arterial disjointed Impella device, a rare complication that was successfully managed with an unconventional use of the Fogarty embolization catheter. To prevent such a complication, it is advisable to

schedule pump withdrawal in the hybrid operating room and, in case of unusual resistance, to avoid excessive force during retrieval, using the fluoroscopy to guide device withdrawal.

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EDITORIAL COMMENTARY

Are devices for temporary mechanical circulatory support getting safer?

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See related article on pages e41-3.

I read with interest the case report from Beaulieu and colleagues,¹ in which an Impella 5.0 microaxial blood pump (Abiomed, Danvers, Mass) fractured during withdrawal after 4 days of use following an acute myocardial infarction.

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They were able to expeditiously and creatively retrieve the dislodged fragment from the aortic bifurcation without additional invasive approaches and without harm to the patient. The authors should be congratulated on their outcome, and specifically, on the successful use of temporary mechanical circulatory support for cardiogenic shock. Their strategy to initiate support early prevented end-organ injury and the inevitable decline from multisystem organ failure that is so often seen in protracted low-cardiac output states.

Temporary mechanical circulatory support encompasses a spectrum of devices that includes peripheral and centrally employed extracorporeal blood pumps, extracorporeal

membrane oxygenation, and transvalvular microaxial pumps. Historically, temporary mechanical circulatory support was associated with numerous device-related complications, prompting both avoidance of its use and delay of initiation until a point at which restoration of circulation could not salvage irreversible organ damage. However, substantial evolution has occurred in the technology available to provide emergency circulatory support. These advances are purported to reduce invasiveness and thrombogenicity, and to improve patient safety.

Use of the Impella pump (Abiomed), described in this report, has undergone a dramatic increase worldwide, since its introduction in 2006. A single site of cannulation, flexible insertion locations, and a relatively low profile have led to its being enthusiastically applied to provide support in cardiac procedures and cases of postcardiotomy shock, and resuscitation from acute myocardial infarctions. Given the acuteness of these conditions, the frequency of adverse events that accompany pump use, including thrombosis, hemolysis, and vascular injury, is not surprising.

The complication described in the article from Beaulieu and colleagues¹ has not been previously reported. The manufacturer suggested that “user error” during insertion caused damage to the pump that weakened the joint, rendering it more susceptible to fracture during extraction across the aortoiliac junction. The authors, however, do not think that their technique or any attributes of the patient contributed to the event. Questions that arise from such an

incident are: Is it a problem? Is this device prone to similar events? What reliability testing has the manufacturer completed to ensure safety in routine, and sometimes nonroutine, clinical use of this pump?

With thousands of Impella devices implanted and only this single report of intracorporeal pump fracture, this event is clearly rare. The authors wisely suggested that fluoroscopic image guidance be used during removal, to identify undue tension on the pump at sites of vessel narrowing or angulation. In addition, they cautioned against its use when a vessel atherosclerosis or calcification occurs that could impinge on or damage the pump.

As this article¹ demonstrates, we need to find ways of making such devices safe and effective. But additionally, we need to identify and characterize their limitations, to help guide engineers in adequately addressing those deficiencies in the next-generation designs. To quote Bill Gates: “It’s fine to celebrate success but it is more important to heed the lessons of failure.” Although most case series tend to highlight unexpectedly good outcomes, learning what does not work is often more instructive. The focus of this article¹ is on an unconventional technique used to deal with a problem, but the real value of the example is in understanding how to avoid the problem.

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