

## INTRODUCTION

There are several types of mechanical devices that can be utilized to assist heart function in patients with cardiogenic shock, or severe heart failure. These devices are called ventricular assist device or VADs. VADs can have pulsatile or continuous flow, support the left ventricle, right ventricle or both, and they can be extracorporeal or intracorporeal. Some are used on a short term basis, and others can be used for months to years. One of the intracorporeal short term VAD options is an Impella device. This is a type of left ventricular assist device with a small pump built inside of a catheter. It is placed across the aortic valve and helps pump blood from the left ventricle into the aorta. This decreases left ventricular end diastolic pressure, which in turn decreases the workload of the left ventricle and lessens the oxygen demands of the heart. This device increases mean arterial pressure and cardiac output. This allows the heart to rest and recover in cases of cardiogenic shock and may be used as a bridge to transplant in patients with heart failure.

## OBJECTIVES

- Understand the physiology and mechanisms of different ventricular assist devices.
- Understand how the Impella device works
- Discuss a case of aortic dissection and thrombus thought to be caused by an Impella device
- Understand common complications from Impella use

## CASE

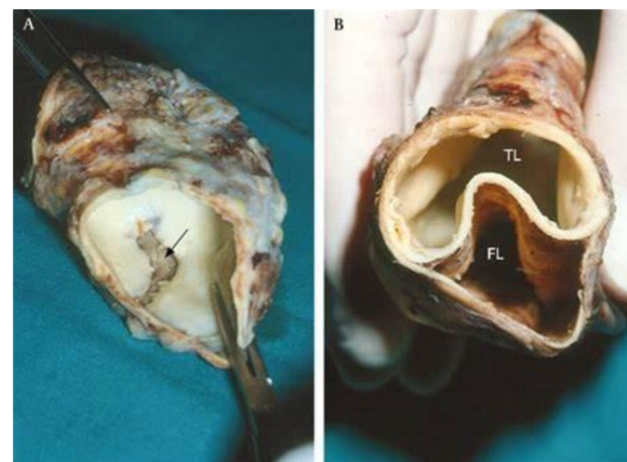
A 41-year-old male with no significant medical history was diagnosed with dilated nonischemic cardiomyopathy after initially presenting to the ER with cough, dyspnea, and lower extremity edema. He was extensively diuresed and started on inotropic agents. Trans thoracic echocardiogram showed an ejection fraction of 14% with a severely enlarged left ventricle and left atria. Right heart catheterization confirmed ongoing decompensated cardiogenic shock, despite inotropic support. An Intra aortic balloon pump was placed to assist with cardiac function. The patient underwent evaluation by the transplant service and was ultimately listed for a heart transplant. On the day he was approved, the decision was made to remove the IABP and place an Impella device for greater mobility. An Impella 5.5 device was placed via right axillary artery and remained for 8 days before a suitable donor was found for transplant. During the transplant surgery, as the Impella was removed, the surgeon noticed a flap in the transverse aortic arch on trans esophageal echocardiogram consistent with an aortic dissection. The donor heart was accruing ischemic time and the decision was made to continue with the transplant. The recipient's heart was excised and when the aorta was transected there was a flap of the ascending aorta with organized thrombus. The dissection was repaired, and the transplant was successfully completed. Afterwards a CTA was performed to better characterize the dissection. This showed a Type A aortic dissection with the flap beginning 3cm distal to the sinotubular junction. This dissection was thought to be a complication of the Impella device. The patient recovered from the transplant and is continuing to follow up on an outpatient basis.

## IMAGE 1

Classification of aortic dissection			
Percentage	60%	10-15%	25-30%
Type	DeBakey I	DeBakey II	DeBakey III
	Stanford A		Stanford B
	Proximal		Distal

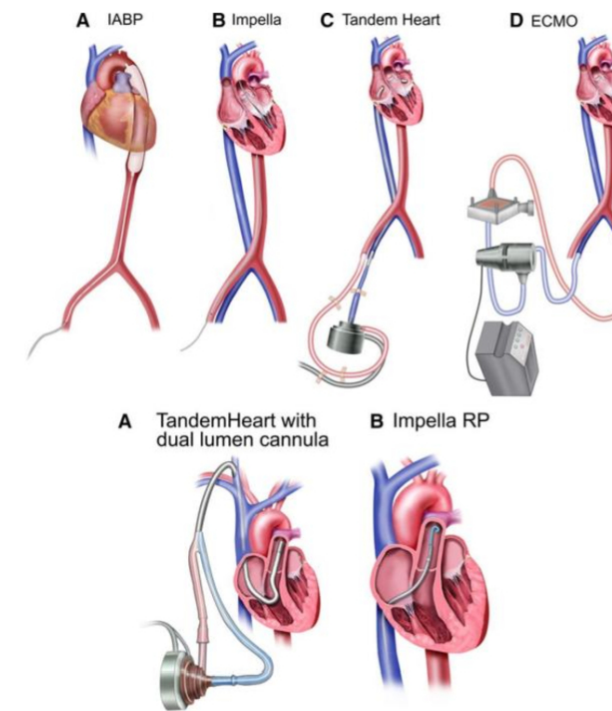
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## IMAGE 2



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## IMAGE 3



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## CONCLUSIONS

Patients with heart failure have a low survival rate and often diminished quality of life. It is important to recognize the need for mechanical circulatory support of the heart in these patients and differentiate which device to utilize for support. When using any type of mechanical circulatory support, it is important to understand the potential complications and implement the appropriate monitoring. Providers must weight the risks versus benefit with each method of cardiac support, although sometimes options for these patients can be limited.

## DISCUSSION

Although mechanical support of the heart with devices like the Impella can be lifesaving, they do not come without risks. Several complications have been associated with the Impella devices. Hemolysis, access site bleeding, limb ischemia, aortic injury, and left ventricular perforation are among the most common documented complications. Infection is a common cause of death in patients with long-term VAD support. Devices can malfunction or cause arrhythmias. Rates of these complications differ depending on underlying illness, age, mechanical ventilation, and heart function. It is important to maintain close monitoring of patients with Impella devices and assess for complications frequently. Ultrasound can also be a useful tool to confirm placement within the heart.

## REFERENCES

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