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Commentary: Prosthetic valves: A pain in the neck during extracorporeal membrane oxygenation management

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CENTRAL MESSAGE

ECMO management for patients with prosthetic valves is challenging due to the risk of prosthetic valve thrombosis.

Chiang and colleagues¹ report a case of mitral prosthetic valve thrombosis (PVT) during venoarterial extracorporeal membrane oxygenation (VA-ECMO) support. They successfully managed the condition by switching VA-ECMO to a temporary left ventricular assist device (LVAD) to take advantage of the entire cardiac flow across the mitral valve with an expectation of a so-called washing effect to prevent PVT. We congratulate their success in an extremely difficult situation.

Management of VA-ECMO becomes challenging when a patient has any type of prosthetic valve in any position because ECMO decreases flow through the cardiac chambers, predisposing patients to intracardiac stasis and PVT.² Attention should be paid to native heart function and volume status of each cardiac chamber in this setting. Although Chiang and colleagues² did not address it in their article, pulmonary artery catheter-guided management is essential to monitor volume status inside the cardiac chamber and LV distension. To maintain pulmonary and systemic arterial pulsatility (ie, the valves open and close at each cardiac cycle), we apply partial ECMO flow in conjunction with the use of inotropes to prevent intracardiac stasis and PVT. If a patient develops LV distention and pulmonary edema, intra-aortic balloon pump may be used to reduce

the afterload of the LV.³ A surgical vent also may be a choice, but its approach and the position of the prosthetic valve should be taken into account. For example, a vent via the pulmonary vein or artery could reduce the blood flow across the mitral valve prosthesis and an apical vent could lead to blood stasis in the aortic root. If these approaches fail due to severe ventricular dysfunction, temporary VAD should be a treatment of choice. A tricky part of the approach used by Chiang and colleagues¹ is that temporary LVAD would not guarantee flow across a prosthetic mitral valve. Isolated LVAD needs adequate right ventricular function (we learn this from durable LVAD experience). In patients with postcardiotomy cardiogenic shock, biventricular function is often compromised (ie, prolonged crossclamp time). In this setting, only biventricular temporary VAD could guarantee adequate flow across the prosthetic mitral valve to prevent PVT.

There is another concern: A fully unloaded ventricle may not generate enough pressure to ensure valve closure and fix the prosthetic mitral valve leaflet in the open position and cause blood stasis outside the leaflet. Barbone and colleagues⁴ reported a case of an LVAD-supported patient in whom a mitral prosthesis was fixed in the open position and the leaflets were trapped by thrombi. This problem may not become obvious clinically for patients supported on LVAD, but patients with temporary support would develop massive mitral regurgitation immediately after termination of LVAD support.

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This is a valuable scenario to call attention to the management of VA-ECMO for patients with prosthetic valves. Further discussion is warranted for the optimal strategy.

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