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Commentary: Venoarterial extracorporeal membrane oxygenation, ventricular dysfunction, and a mitral valve prosthesis: A recipe for valve thrombosis?

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Venoarterial ECMO (VA-ECMO) is an important circulatory support modality for postcardiotomy shock at many institutions.¹ Chiang and colleagues² describe a 40-year-old woman who developed thrombosis on a recently implanted mitral valve bioprosthesis while she was supported with VA-ECMO. The authors successfully removed the thrombus surgically by changing the VA-ECMO support for a central temporary left ventricular assist device (LVAD) via LV apical cannulation. This elegant strategy allowed patient recovery with subsequent discharge from the hospital.

Because intracardiac thrombus is a highly morbid and challenging complication, this case study nicely illustrates the hemodynamic consequences of VA-ECMO on LV loading conditions. Compromised flow through the left side of the heart due to a severely dysfunctional ventricle while on VA-ECMO support is a potentially dangerous situation. The risk of intracardiac thrombosis is further exacerbated by the presence of prosthetic material that serves as a nidus for thrombosis. In this situation,

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Disclosures: The authors reported no conflicts of interest.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

Received for publication April 28, 2020; revisions received April 28, 2020; accepted for publication April 30, 2020; available ahead of print May 5, 2020.

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JTCVS Techniques 2020;3:209-10
2666-2507

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<https://doi.org/10.1016/j.xjtc.2020.04.022>



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CENTRAL MESSAGE

The risk of intracardiac blood stasis and prosthetic mitral valve thrombosis should be kept in mind for patients who require a temporary mechanical circulatory support after mitral valve replacement.

predisposing conditions—the ingredients for arterial thrombus formation—are met, including blood stasis, inflammation and thrombosis induced by prosthetic biomaterial, and hypercoagulability imposed by the postoperative state.³ Therapeutic anticoagulation may not be sufficient to avoid intracardiac thrombus formation.⁴

The surgical strategy chosen by the authors, a temporary centrifugal LVAD with apical cannulation, is a very efficient way to unload the left ventricle and maintain a washing flow dynamic through the mitral bioprosthesis. A large-caliber LV apical cannula is predictably efficient at unloading the left ventricle and simultaneously promoting high-volume, mostly unidirectional flow across the mitral valve from the left atrium to the left ventricle. A smaller caliber LV vent placed either through the left atrium or LV apex may not reproduce the favorable flow dynamics of a large-bore LVAD apical cannula. However, the temporary LVAD does pose higher surgical risk in the setting of postoperative myocardial stunning. Candidacy for this approach would be contingent on the tissue quality of the LV apex as well as the surgeon's familiarity with LV apical cannulation techniques. Other strategies to minimize stasis can be classified as those that decrease left ventricle preload (eg, left atrial trans-septal venting, pulmonary artery venting, or Impella device [Abiomed Inc, Danvers, Mass]), or reduce left ventricle afterload (eg, intra-aortic balloon pump). Patients at risk for left-sided chamber stasis and thrombosis during mechanical circulatory support will require an individualized treatment strategy that ranges from placement of an

intra-aortic balloon pump to a temporary central LVAD, as employed here. The balance between surgical risk and benefit is dependent on the degree of ventricular dysfunction, coagulation status, mode of presentation, and level of acuity.

This case highlights the need to anticipate and monitor for left ventricle distension and stasis in patients supported with VA-ECMO and possess risk factors for thrombosis such as severely depressed LV function with poor LV ejection, inconsistent or lack of aortic valve opening, presence of intracardiac prosthetic material, anticipated low anticoagulant levels due to factors such as postoperative bleeding risk, and previous thrombus in left-sided cavities. Minimizing the risk of intracardiac thrombosis by utilizing an LV venting strategy whether peripherally (trans-septal

venting or Impella device) or centrally placed should be strongly considered early in these thrombosis-prone settings. The authors should be congratulated for their thoughtful efforts and success in this young patient faced with a complex shock scenario.

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