Commentary: Rescue is feasible—Prevention is preferred

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David Bichell, MD (left), and Nhue Do, MD (right).

Central Message

ECMO can be successful support for an unstable patient with septal hematoma. Early detection of this rare complication may inform intervention, averting instability and obviating the need for rescue.

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The architecture of the interventricular septum is still disputed. Whether it is a bilayer structure with overlapping helical bands of muscle^{1,2} or a trilayer structure with alternating fiber orientations,³ however, its distinct layers may represent fault lines, separable into fracture planes by a dissecting hematoma.

The first septal perforator artery courses through the interventricular septum and terminates near the base of the medial tricuspid papillary muscle. If ventricular septal defect closure sutures venture too deep outside the safe area delimited by the medial papillary muscle and the outlet septum, injury may occur. Because the septal perforator also is the blood supply to right and left bundle branches, injury to it may also be injury to the conduction system.⁴

Septal hematoma, from apparent injury to the septal perforator at ventricular septal defect closure suture placement, can cause a contained hematoma between the layers of the interventricular septum, bulging it into both right and left ventricular outflow tracts and producing biventricular outflow obstruction, heart block, and acute cardiovascular collapse. Yoneyama and colleagues⁵ reported a case and literature review aggregating 12 reported cases of interventricular septal hematoma after cardiac surgery collected from 10 institutions, with each reporting 1 to 2 cases in the course of a decade. One patient died before reintervention, and 4 underwent urgent drainage procedures. The remaining patients were discharged home after expectant treatment (1 died at 8 months). All showed resolution between 2 weeks and several months, with most managed without drainage or extracorporeal membrane oxygenation (ECMO).⁵

Jegatheeswaran and colleagues,⁶ in this issue of the *Journal*, describe a single-institution series of 12 cases of interventricular septal hematoma after ventricular septal defect closure. Jegatheeswaran and colleagues⁶ demonstrate the use of ECMO to support 5 of these 12 patients until hematoma resolution, raising awareness of ECMO as an aid to recovery from this potentially lethal complication. It is

remarkable that a single institution can see this exceptionally rare complication 12 times in the past decade. The value of ECMO rescue is importantly demonstrated for patients who have severe hemodynamic compromise.

Even as the case series demonstrates the utility of ECMO support until the hematoma runs its natural course, there is potential additional untapped value of this experience in identifying preemptive trigger points for urgent early reintervention, aimed at avoiding the compromise for which ECMO is the rescue. Between this report and the previous literature, it appears that a hematoma's appearance and expansion ranges from immediate to a few hours after surgery. It would be useful to review intraoperative completion echocardiograms that might identify sentinel characteristics, forewarning the surgeon with a threshold for preemptive drainage before hemodynamic collapse and thus before the need for ECMO.

The world experience with this rare complication underscores the importance of awareness of the septal perforator territory during surgery and heightens vigilance for interventricular septal hematoma after surgery. ECMO may be a useful bailout, but the order of priority might best be (1) prevention of injury to the septal perforators, (2) early recognition of incipient expanding hematoma with preemptive intervention, and, lastly, (3) ECMO rescue. ECMO is a last resort, as might be said about any operation.

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