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EDITORIAL COMMENT

Stress-Induced Shock

Favorable Outcomes With Mechanical Circulatory Support*

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Mohammedzein et al. (1) describe the clinical case of a 90-year-old female patient who suffered cardiogenic shock (CS) secondary to Takotsubo cardiomyopathy. The patient had ejection fraction (EF) of 20% to 25% and a left ventricular outflow tract (LVOT) gradient of 100 mm Hg with systolic anterior motion (SAM) of the mitral valve. The authors implanted a left ventricular assist device (LVAD) and the patient's cardiac function recovered. Stress-induced cardiomyopathy, also known as Takotsubo cardiomyopathy, may present with cardiogenic shock (CS) in 12% to 45% (2), and is associated with significant mortality, albeit lower than CS associated with an acute myocardial infarction (15% vs. 35%, odds ratio: 0.32; 95% confidence interval: 0.25 to 0.39; $p < 0.001$) (2). The National Inpatient Sample database demonstrated that Takotsubo-associated CS (TC-CS) comprises of 1.2% of all cases of CS, and that patients are likely to be younger, postmenopausal white women; are more likely to have respiratory failure requiring mechanical ventilation; and are less likely to have comorbidity or to have a cardiac arrest compared with patients with CS associated with an acute myocardial infarction (3).

As with any presentations with shock, a time-sensitive and goal-directed approach is critical in the successful management of TC-CS. The goal being to stabilize the hemodynamics in order to maintain end organ function with inotropes/vasopressors and timely referral and introduction of mechanical circulatory support (MCS). Thus, transferring patients to centers where MCS is available is essential.

Achieving an accurate diagnosis of TC-CS and phenotyping the subtype (apical ballooning, midcavity, basal, or focal involvement) usually involves assessment of the coronaries with angiography left ventriculography and imaging with echocardiography (2). The latter is paramount in ensuring the presence or absence of left ventricular outflow tract obstruction (LVOTO), occurring in up to 25% of patients, mitral regurgitation, and assessment of right ventricular systolic function, all of which are associated with poor outcome and will also determine how one would support the patient medically and also what treatments one should avoid.

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For example, in patients who appear to develop LVOTO inodilators should be avoided, as increased contractility and vasodilatation is likely to worsen the LVOTO and drop the systolic pressure further. The presence of LVOTO should be treated with the aim of increasing afterload with intravenous fluids and vasopressors such as norepinephrine and phenylephrine. When there is failure of response to this treatment, timely introduction of MCS is crucial. The type of MCS used will depend on availability of local expertise and the type of devices available. Venoarterial extracorporeal oxygenation (VA-ECMO) and IMPELLA device (Abiomed, Danvers, Massachusetts) may help support the circulation and maintain organ perfusion and avoid multiorgan dysfunction. In the absence of LVOTO in TC-CS, inotropes such as levosimendan in conjunction to escalation to intra-aortic balloon pump and MCS should be considered.

The expectation is that recovery of the myocardium is likely to occur within several days of

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treatment, but despite this, short-term mortality of TC-CS is high, with almost one-third of patients not surviving in some reports (4); however, survival remains more favorable than most other causes of CS.

The data to support the use of MCS devices in TC-CS is currently limited to case reports. Developing an evidence base for the use of MCS for TC-CS is likely to be challenging, in view of it its low incidence in comparison to other causes of CS. However, in the future small-sized multicenter randomized studies assessing efficacy, the various MCS technology on survival should be considered.

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