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# Chasing the Cardiogenic Shock Unicorn

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Editorial

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Cardiogenic shock (CS) in the setting of acute myocardial infarction (MI) is a deadly condition, and there has been a search for the optimal treatment strategy for years. However, in-hospital survival with CS has plateaued at 60% to 70%. Several reports in the literature emphasized the need for more scientific evidence on the optimal management of CS complicating MI. The recently published position statement by the Acute Cardiovascular Care Association of the European Society of Cardiology has summarized the recent evidence and provided expert consensus.[1]

The key points from this position statement relating to the management of CS in the MI setting are (1) direct admission or transfer of patients to regional centers for CS with 24-hour/7-day percutaneous coronary intervention (PCI)/coronary artery bypass graft/mechanical circulatory support (MCS) availability, with the focus on risk stratification using Intra-aortic Balloon Pump in Cardiogenic Shock II (IABP-SHOCK II) score and advanced monitoring; (2) early revascularization to reduce ischemic time either with PCI or coronary artery bypass graft, limited to the culprit lesion, with possible staged revascularization of other lesions when PCI is considered; (3) use of intravenous antiplatelet agents and intravenous anticoagulants strategy in the setting of PCI; (4) catecholamines administered at the lowest possible dose and for the shortest possible duration, with specific preference for norepinephrine as the vasoconstrictor of choice when blood pressure is low and tissue perfusion is insufficient; (5) the routine use of the intra-aortic balloon pump (IABP) is not recommended and other MCS such as Impella, TandemHeart, and ECMO cannot be recommended as first-line treatment in CS; the use of percutaneous MCS devices should be restricted to cases of refractory CS and relying on individual experience in dedicated centers; (6) in patients with CS in cardiac arrest, moderate therapeutic hypothermia (33°C) after resuscitation should be the targeted temperature; (7) in cases of mechanical complications, such as ventricular septal defect or acute mitral regurgitation, current ESC guidelines recommend the use of IABP; and (8) besides the general principles of RV dysfunction management, the use of MCS devices, with dedicated RV support or VA-ECMO, may be considered in certain patients with refractory CS.

The most significant change is the recommendation against routine PCI in the non–infarct-related artery, after the CULPRIT-SHOCK trial showed a significant clinical benefit of a culprit-lesion–only strategy, with a reduction in the primary endpoint of 30-day mortality or renal replacement therapy.[2] In addition, the newly proposed definition and 5 stages of CS by the Society for Cardiovascular Angiography and Interventions,[3] to guide identification and rapid detection/management of CS, have provided more granularity in the management approach to CS following acute myocardial infarction.

The concept of regional cardiogenic shock centers, which are equipped with at least 2 catheterization laboratories with 24-hour PCI service and on-site surgery and are experienced in the use of at least 2 MCS devices, is introduced here to coordinate and optimize the outcome of CS care. Apart from revascularization, most of the current recommendations are based on registry data or expert opinion. Moreover, CS in MI is a complex condition with wide diversity; hence, results from a clinical trial might not be applicable to every CS patient. For instance, although the IABP was shown to have no benefit in the IABP-SHOCK trial, this device routinely is used in catheterization laboratories worldwide for different reasons/indications. The hotly anticipated DanGer trial (clinicaltrials.gov: NCT01633502) on the MCS device Impella (Abiomed Inc.) might not offer the answer for all CS patients. And although success rates with percutaneous devices, such as the Impella have not been uniform, this device is also part of the therapeutic armamentarium. Although the CS unicorn chase continues, there must be comfort in being uncomfortable! It is technically challenging to conduct a vigorously designed randomized controlled trial in treatment of CS MI patients, as the condition itself is too complex to be generalized; the recruitment time frame is narrow, along with ethical dilemmas. Yet, the field will not move forward without venturing into the unknown. Apart from left ventricular failure, the previously forgotten right ventricle (RV) has started to gain attention in the management of refractory cardiogenic shock. Yet, a lot of uncertainties still exist including how to define RV failure and how to support the RV acutely both in the operating room and catheterization suite. New percutaneous MCS, with smaller profiles (Impella ECP), with higher support power or different

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unloading mechanisms (Impella 5.0, TandemHeart), now are available or under investigation. Off-label applications of percutaneous techniques or devices have been reported (eg, MitraClip in papillary muscle rupture,[4] percutaneous ventricular septal rupture closure[5]) to manage mechanical complications of MI in surgically inoperable patients. MCS is not without risk,[6,7] and not every patient with CS requires MCS. The future undoubtedly will see more advances in the technology of percutaneously placed circulatory assist devices for CS patients; the question is, will outcomes concomitantly improve?

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## Conflict of Interest

None.

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## References

1 Zeymer U, Bueno H, Granger CB, et al. Acute Cardiovascular Care Association position statement for the diagnosis and treatment of patients with acute myocardial infarction complicated by cardiogenic shock: A document of the Acute Cardiovascular Care Association of the European Society of Cardiology. Eur Heart J Acute Cardiovasc Care 2020;9:183–97.
2 Thiele H, Akin I, Sandri M, et al. One-year outcomes after PCI strategies in cardiogenic shock. N Engl J Med 2018;379:1699–710.
3 Baran DA, Grines CL, Bailey S, et al. SCAI clinical expert consensus statement on the classification of cardiogenic shock: This document was endorsed by the American College of Cardiology (ACC), the American Heart Association (AHA), the Society of Critical Care Medicine (SCCM), and the Society of Thoracic Surgeons (STS) in April 2019. Catheter Cardiovasc Interv 2019;94:29–37.
4 Valle JA, Miyasaka RL, Carroll JD. Acute mitral regurgitation secondary to papillary muscle tear: Is transcatheter edge-to-edge mitral valve repair a new paradigm? Circ Cardiovasc Interv 2017;10.
5 Calvert PA, Cockburn J, Wynne D, et al. Percutaneous closure of postinfarction ventricular septal defect: In-hospital outcomes and long-term follow-up of UK experience. Circulation 2014;129:2395–402.
6 Subramaniam AV, Barsness GW, Vallabhajosyula S, et al. Complications of temporary percutaneous mechanical circulatory support for cardiogenic shock: An appraisal of contemporary literature. Cardiol Ther 2019;8:211–28.
7 Thiele H, Jobs A, Ouweneel DM, et al. Percutaneous short-term active mechanical support devices in cardiogenic shock: A systematic review and collaborative meta-analysis of randomized trials. Eur Heart J 2017;38:3523–31.