



# The use of mechanical circulatory support in post-acute myocardial infarction mechanical complications

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The management of patients affected by mechanical complications following acute myocardial infarction (AMI) represents an unquestionable challenge due to its increasing prevalence and unchanged mortality rates (1-3). Indeed, the clinical and hemodynamic status of a patient, as well as the cardiac structural condition, pose different impacts on the timing and type of treatment, ultimately impacting patient outcomes (1-3). In most cases, a surgical approach is the gold standard of care although, recently, percutaneous transcatheter procedures have been proposed for inoperable patients or as a bridge-to-surgery strategy (1-3).

Often, hemodynamic compromise requires immediate treatment without delay (1-3). However, in certain circumstances, delaying treatment may correspond to a greater chance of a favorable outcome, such as in the presence of ventricular septal rupture (VSR) (1-3). Furthermore, hemodynamic instability, which often characterizes the preoperative phase of these patients, may persist in the post-operative phase due to unavoidable conditions such as surgery-related ischemic damage, compromising the right ventricle (1-3). These aspects translate into a high risk of low cardiac output syndrome (LCOS) and other perioperative shortcomings, which may be difficult to treat and overcome. In such circumstances, the use of mechanical circulatory support (MCS), particularly in the case of a bridge-to-recovery or to a more advanced therapy (heart transplantation or left ventricular assist device), may also represent a potential alternative, provided that the inclusion

criteria and indications are met (1-5).

Rather surprisingly, a recent large investigation has shown that the use of MCS in post-AMI mechanical complications has remained limited (less than 10%), despite in-hospital mortality rates remaining unchanged and remarkably high (almost 60%) (4). It can therefore be stated that the application of MCS is underutilized in cardiogenic shock, particularly in patients affected by post-AMI mechanical complications, either pre- or post-operatively (4). The reasons for this are not clear. Reports regarding the efficacy and benefit of MCS pre-, intra-, and/or post-operatively, even for a short time, have been published (5-8). MCS may therefore, provide a significant advantage either in terms of improved patient condition at surgery, enhanced intensive care unit-based management and ultimate patient outcome (5-8).

The use of MCS in post-AMI mechanical complications, however, must start from an in-depth knowledge of the interplay between the MCS devices and the underlying cardiac pathology and related pathophysiology. This is because the adjunct of such devices or procedures on the ongoing cardiac structural injury may generate maladaptive pathophysiological and hemodynamic changes which may lead to further deterioration (6). The appropriate decision regarding the use of MCS in each patient, should include an open discussion within the involved team and careful consideration of the benefits and risks to the patient (1-3). What is critical about the use of MCS in patients with

post-AMI mechanical complications is determining the correct timing of MCS application and avoiding application in the presence of profound or refractory end-organ damage, severe acidosis, high inotropic or vasoconstrictor requirement and signs of other refractory end-organ dysfunction (5-8). These are the declared enemies in all cardiac surgery conditions, but in these circumstances, where the AMI insult is associated with the detriment of a mechanical complication, the provision of MCS is even more critical. Indeed, reducing the workload, allowing myocardial and other organ function recovery, as well as undergoing surgery with a planned protected peri-operative approach, may all represent clear determinants for a successful outcome, or at least a reduction in the occurrence of LCOS or a difficult and complicated perioperative course (5-10). The shortcomings associated with MCS however, should not be underestimated. Complications, even severe and life-threatening, are possible and may result in further burden to the patients' clinical course and negatively impact the eventual outcome (5-10).

The final recommendation for this topic is to always bear in mind that the post-operative phase may present further complications, such as the onset or persistence of hemodynamic instability, increased tension on repaired cardiac lesions (particularly in the case of repaired VSR or free-wall rupture), and protracted LCOS, with eventual further damage to peripheral organ function (1-3,9,10). These complications must be recognised and treated in a timely fashion. MCS may represent a proper tool to guarantee improved pre-, intra-, and post-operative outcomes, provided that appropriate overall patient evaluation and training/education is given. This would provide caregivers with support during decision-making, and limit potential complications (5,6).

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### Footnote

*Conflicts of Interest:* RL is a consultant for Medtronic, Getinge and LivaNova, and Member of the advisory board of Eurosets and Fresenius/Xenios. The other authors have no conflicts of interest to declare.

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