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Debate

Debate: ECMO in patients with cardiogenic shock due to myocardial infarction. A clinician's perspective

A debate: El ECMO en pacientes con shock *cardiogénico por infarto de miocardio. Perspectiva del clínico*

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Question: In your center, which patients with cardiogenic shock due to myocardial infarction are currently considered candidates for extracorporeal membrane oxygenation (ECMO)?

Answer: Several factors influence the decision to use an ECMO-type mechanical circulatory support device in patients admitted for acute myocardial infarction (AMI) complicated by cardiogenic shock. When we're dealing with shock, we can quantify its severity through a detailed clinical assessment and by analyzing various hemodynamic parameters. These can be easily obtained at admission using straightforward imaging techniques like echocardiography, even at the bedside. Key factors such as mean arterial pressure, lactate levels, and urine output are crucial here. ECMO support can make a real difference in these cases, acting as a bridge therapy until we can treat the underlying cause, see improvement, or until we move to long-term ventricular assist devices or heart transplantation.

However, it's important to remember that some factors cannot be modified by mechanical circulatory support devices. These include the patient's biological age, overall frailty, severe comorbidities, and the depth of coma following cardiac arrest. These elements should be assessed as objectively as possible because they play a significant role in determining the patient's overall prognosis.

In clinical practice, if we could focus purely on high hemodynamic risk, it would be reasonable to conclude that, at this point, it's difficult to justify escalating to ECMO—with all its associated complications—in patients at stage C of the SCIA (Society of Cardiovascular Angiography and Interventions) classification. This is especially true if we´ve already successfully treated the triggering cause (for example, percutaneous revascularization of an ST-segment elevation myocardial infarction). At stage C, the patient is typically stable and well-perfused on fixed doses of usually just one drug. So, why take on additional risks?

While we still have a lot to learn, ECMO can be a game-changer for patients who worsen after early first-line therapy, particularly in stages D/ E of the SCAI classification. This is especially the case when there's a delay in resolving the underlying cause or we can't correct it—like a myocardial infarction with onset more than 12 to 24 hours previously, a final Thrombolysis in Myocardial Infarction (TIMI) flow of 0-1, or no-reflow phenomena.

Finally, when we're dealing with patients in SCAI stages D/ E who've been resuscitated from cardiac arrest and are admitted in a comatose state, they're automatically at high hemodynamic and neurological risk. Given that post-anoxic encephalopathy is the leading cause of death in these patients, it wouldn't be reasonable to ignore factors related to survival with good neurological outcome (Cerebral Performance Category 1-2) when we're considering whether to escalate therapy. In these situations, our approach should probably resemble the strategies used in ECMO-assisted CPR for refractory cardiac arrest. The key here is to avoid futile interventions by sticking to strict criteria and protocols.

At our center, with our extensive experience in managing cardiac arrest and postresuscitation care, we consider ECMO implantation for patients in shock after an AMI in SCAI stages D/E, but under specific conditions. We're talking about patients whose cardiac arrest was witnessed, ideally with immediate resuscitation—or if not, with no-flow times under 5 minutes—a nontraumatic cause, and an initial shockable rhythm, especially in out-of-hospital arrests. We also pay close attention to indicators of the quality of resuscitation efforts, like initial pH levels and end-tidal CO_2. Now, if the predictors of neurological recovery are unfavorable, we usually stick to the classic approach for managing shock, at least initially. Because these patients are at high risk for postanoxic encephalopathy, we make sure our postresuscitation efforts carefully adhere to international guidelines, which currently include temperature control. But if, after the immediate period, we start to

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see signs that suggest a benefit from escalating therapy—like a return of consciousness or low suppression rates on cerebral monitoring in the first 6 to 24 hours[1]—and if the patient is still in shock at SCAI stage D/ E, we would then reopen the discussion about ECMO implantation.

As you can see, this process is much more complex and demands significantly more time and resources. Sure, it might be easier to place ECMO without considering all these factors, but what would be the point? Are we just looking at the potential for organ donation?

So, to sum up, at our center, we take a case-by-case approach to patient selection. We reserve ECMO for those who don't respond significantly and rapidly to shock treatment—like primary angioplasty—in SCAI stages D/E, and who don't have other short-term poor prognostic factors.

Q: Has your strategy changed after the results of the ECLS-SHOCK trial?[2]

A: The ECLS-SHOCK trial has reinforced our routine practice. We've never been an "ECMO for all" center because ECMO isn't without its risks and certainly shouldn't be the first-line treatment for all patients with an AMI complicated by cardiogenic shock. What this study has done is push us to continue emphasizing a tailored approach through our multidisciplinary Shock Team, which has expertise in both clinical care and mechanical circulatory support. A characteristic that adds quality to our process is the team's 24/7 availability. These cases often don't follow a 9-to-5 schedule—they can occur at any time, including late at night or on nonworking days. Delays in diagnosing and treating the underlying cause or in stabilizing the patient can significantly impair outcomes. That's why, in managing cardiogenic shock after an AMI, we've been adopting strategies similar to primary angioplasty, such as aiming to achieve a less than 90-minute interval from the first medical contact to ECMO implantation.

We believe it's not just ECMO alone but the combination of all the elements involved in the decision-making and treatment process that can truly change the course in patients in shock after an AMI. An example of this is the in-hospital mortality rates reported by the National Shock Initiative in the United States, which are around 25% to 30%.[3] These numbers are much lower than the 40% to 50% 30-day mortality rates reported by many centers, even tertiary hospitals, that don't have a specific focus on managing cardiogenic shock.

Q: We would like to know your overall view on the most positive and, also, most controversial aspects of this study.

A: Just a few of the factors that make it difficult to generate evidence through randomized trials in acute cardiac care are the patients' clinical status, the cost of treatment, and the ethical implications of not offering all available resources to someone on the brink of death. Very few authors are willing to undertake such studies, and even fewer actually see them through to completion. So we really have to give credit to those who do. That said, the study in question is negative, and we need to carefully interpret the information we've got. There are several limitations that we can't ignore when evaluating its results and applying them to our routine clinical practice.

Recruiting a sample of that size for a complex disease within a reasonable timeframe sometimes requires some leeway. In fact, randomized clinical trials often end up sacrificing some of the more "clinical" aspects to ensure the studies are feasible. For instance, Thiele et al.[2] have tried to show the benefits of early and nonselective ECMO use in patients with shock after an AMI who are scheduled for revascularization. But does this really address the core question we need to answer to improve patient outcomes? Are all patients truly eligible for ECMO?

In my opinion, this "ECMO for all" mindset goes against all the work we've been doing for years to identify the patients who might benefit the most from ventricular assist devices. Why have we developed so many concepts related to etiology, phenotypes, metabolism, risk stratification scales, and modifying factors? What's the point of having Cardiac Shock Centers—those top-tier facilities with the best resources and expertise—unless it's to improve the care of these patients? The aim of the study is, to say the least, surprising, especially considering that the lead author is part of the key working groups focused on this area.[4]

The main weaknesses of the study are that it didn't consider the type of AMI—over 40% of the patients had non-ST-elevation acute coronary syndrome. Also, half of the patients were in SCAI stage C and were still considered for ECMO, but in clinical practice, it's rare to implant ECMO in this group. Neurological death is undoubtedly a competing risk in patients who have recovered from a cardiac arrest (77.7% in this study), so it's surprising that there is only one exclusion criterion related to neurological issues (duration > 45 minutes) and that it's somewhat arbitrarily defined. Since postanoxic encephalopathy wasn't considered in patient selection, high-quality postresuscitation care should have been a priority, but it wasn't. Lastly, the high rate of vascular complications, the percentage of ventricular unloading, and the limited access of a younger population with shock after an AMI to therapies such as long-term assist devices or heart transplantation, make one wonder about the experience of the participating centers in managing these patients (47 centers were involved but included only 44 patients, with 61.4% being tertiary centers).

Q: Do you think a new study on this topic is needed?

A: Absolutely. Cardiogenic shock is still the most serious unresolved issue in the context of AMI, and circulatory support, in this case ECMO, has a very sound rationale. Even with the overall negative results of this study, we cannot stop research in this area.

The next study should avoid some of the possible causes of failure, such as by: *a)* selecting the best candidates, as patients with shock are a widely heterogeneous group; *b)* minimizing the delay time before treatment; *c)* ensuring that participating hospitals have greater experience with the technique and, possibly, better outcomes; *d)* increasing the sample size, as has been necessary in the vast majority of clinical trials that have demonstrated clear benefits and have had an impact on reducing mortality—from more than 30% in the early days of coronary care units to about 5% today, which undoubtedly requires adequate funding; *e)* reducing or avoiding crossover (in this case, more than 27% switched to ECMO or other types of support); *f)* ensuring that participation and teamwork are concentrated in a single study; and *g)* if the study selects the best candidates and shows positive results, then it would be time to consider expanding the indications. Until we get all of this right, we should avoid the widespread use of ECMO in cardiogenic shock after an AMI.

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DECLARATION ON THE USE OF ARTIFICIAL INTELLIGENCE

No artificial intelligence was used in the preparation of this article.

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CONFLICTS OF INTEREST

None declared.

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