EDITORIAL COMMENT

Cardiogenic shock in acute myocardial infarction: Stratify to prevent

Choque cardiogénico no enfarte agudo do miocárdio: estratificar para prevenir

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Cardiogenic shock (CS) is defined as persistent hypotension (systolic blood pressure <90 mmHg) secondary to myocardial dysfunction, associated with signs of organ hypoperfusion. CS may be present in 10% of patients with ST-segment elevation myocardial infarction (STEMI) and is associated with 30-day mortality of about 50%. In the majority of STEMI patients, hemodynamic deterioration occurs after hospital admission, which means that there may be room for preventive measures and highlights the importance of early recognition of those most likely to evolve to CS.

Scores such as Controlled Abciximab and Device Investigation to Lower Late Angioplasty Complications (CADILLAC), Thrombolysis in Myocardial Infarction (TIMI), the Global Registry of Acute Coronary Events (GRACE) and the Zwolle risk score are used to stratify patients and enable the adoption of different levels of clinical monitoring, therapeutic care and post-discharge strategies. However, the search for simpler and more accurate scores has continued.

The shock index (SI) is defined as the ratio of heart rate to systolic blood pressure, and was introduced in 1967 by Allgower and Burri to assess the degree of hypovolemia in hemorrhagic or infectious shock states. The SI, which is easy to calculate, is an objective measure of cardiovascular performance and a marker for predicting the onset of hypotension. Assessment of SI in the context of acute myocardial infarction was only used more recently, and a first meta-analysis, of eight studies enrolling 20,404 patients, was published last year. A high SI was associated with increased in-hospital mortality and higher risk of short- and long-term adverse outcomes compared to low SI.

An important limitation of SI is the lack of information about systemic vascular resistance status. Mean arterial pressure (incorporating both systolic and diastolic blood pressure) best represents tissue perfusion status. The modified shock index (MSI), which is the ratio of heart rate to mean arterial pressure, has been shown to be a better predictor of mortality than heart rate, systolic blood pressure, diastolic blood pressure and SI alone in trauma patients.

Shangguan et al. were the first to assess the predictive value of MSI in the context of STEMI. In a retrospective study of 160 consecutive patients, they found that MSI ≥ 1.4, assessed in the emergency department, was an independent factor for major adverse cardiac events and seven-day all-
cause mortality, with a stronger association than SI. Yu et al.
retrospectively studied 1864 STEMI patients undergoing pri-
mary coronary angioplasty to assess whether admission
age SI (age multiplied by SI) and MSI were useful clinical
parameters to predict long-term prognosis, with both show-
ing good prognostic performance.2 The cutoff value of MSI
for the prediction of all-cause mortality was 0.71.

In this issue of the Journal, Abreu et al.10 assess the prog-
nostic value of MSI to predict six-month mortality in a large
retrospective observational study of 1158 STEMI patients
without cardiogenic shock on admission. They found that MSI
≥0.93 was present in about a quarter of the patients and was
associated with worse in-hospital clinical course. Adverse
events, acute heart failure and cardiogenic shock were sig-
ificantly more frequent in this subgroup. MSI was also an
independent predictor of overall six-month mortality. The
cutoff of 0.93 identified by the authors is between those
in the above studies, which presumably reflects method-
ological differences, such as population selection and the
timing and method for assessing hemodynamic parameters.
However, their approach of using MSI in patients with no
shock at admission, and assessing heart rate and blood pres-
sure in the hemodynamic laboratory, seems to be the most
appropriate and practical way to apply this index in clinical
practice.

Their study has limitations, some of which are acknowl-
edged by the authors, including its single-center and
retrospective design, the lack of a control group to effect-
ively test their hypothesis, and the lack of comparison with
other hemodynamic indices or risk scores. Nevertheless,
the authors should be congratulated for their important contri-
bution to an issue that is still poorly defined and that needs
further investigation, since a simple risk stratification of
these patients remains an unmet clinical need. They have
paved the way for future studies that may validate this
strategy.

Conflicts of interest

The author has no conflicts of interest to declare.

References

1. Ibanez B, James S, Agewall S, et al., ESC Scientific Docu-
ment Group. 2017 ESC Guidelines for the management of acute
myocardial infarction in patients presenting with ST-segment
elevation: the Task Force for the management of acute myocar-
dial infarction in patients presenting with ST-segment elevation
2. Khalid L, Dhakam S. A review of cardiogenic shock in acute
3. Tralhão A, Ferreira AM, Madeira S, et al. Applicability of the
Zwolle risk score for safe early discharge after primary percuta-
neous coronary intervention in ST-segment elevation myocardial
4. Kozieradzka A, Kamiński KA, Maciorkowska D, et al. GRACE,
TIMI Zwolle and CADILLAC risk scores – do they predict 5-year
outcomes after ST-elevation myocardial infarction treated inva-
index for the outcomes of acute myocardial infarction patients:
a systematic review and meta-analysis. Medicine (Baltimore).
2017;96.
and modified shock index with the outcome of adult trauma
8. Shangguan Q, Xu JS, Su H, et al. Modified shock index is a pre-
dictor for 7-day outcomes in patients with STEMI. Am J Emerg
9. Yu T, Tian C, Song J, et al. Age shock index is superior to shock
index and modified shock index for predicting long-term prog-
10. Abreu G, Azevedo P, Braga PG. Modified shock index: a
bedside clinical index for risk assessment of ST-segment eleva-
tion myocardial infarction at presentation. Rev Port Cardiol.