



## EDITORIAL COMMENT

# Metalloproteinases as a prognostic marker in ST-elevation myocardial infarction

## Metalloproteinases como marcador prognóstico de STEMI

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Patients with acute coronary syndromes are a heterogeneous population, with different levels of severity and various predictors of mortality. Due to interactions between the various risk factors, scores have been created in order to identify populations at greater risk.<sup>1,2</sup>

In addition to clinical markers, biochemical markers such as elevated troponin T and C-reactive protein levels are strongly related to the long-term risk of death from cardiac causes.<sup>3</sup>

Matrix metalloproteinases (MMPs) are enzymes involved in extracellular matrix remodeling and leukocyte recruitment to sites of inflammation, and act as important inflammatory modulators. MMP-9 plays a key role in the progression of atherosclerosis and vulnerability to plaque rupture,<sup>4</sup> and its plasma levels increase in patients with acute myocardial infarction. However, available data on the specific impact of baseline plasma MMP-9 levels and their utility as a prognostic marker in coronary artery disease are limited and at times conflicting.<sup>5,6</sup>

In this issue of the *Journal*, Somuncu et al.<sup>7</sup> present a study aiming to assess the clinical significance of MMP-9 in predicting two-year adverse cardiovascular events in patients who underwent primary percutaneous coronary intervention (PCI) after ST-elevation myocardial infarction (STEMI).

In this single-center prospective study, blood was collected from 204 patients with STEMI at hospital admission and before undergoing PCI. Participants were classified as high MMP-9 (n=102) or low MMP-9 (n=102) based on an MMP-9 cut-off of 12.92 ng/ml. Both groups were assessed at one and two years after STEMI.

There was no difference between the high and low MMP-9 groups in terms of baseline or PCI characteristics, but the high MMP-9 group had a significantly higher incidence of cardiopulmonary resuscitation, use of inotropes, cardiogenic shock, intra-aortic balloon pump (IABP) use and no-reflow phenomenon. In-hospital cardiovascular mortality was higher in the high MMP-9 group, but without reaching statistical significance.

When long-term outcomes were analyzed, cardiovascular mortality was significantly higher in the high MMP-9 group at one year (13.7% vs. 4.8% for the low MMP-9 group,  $p=0.030$ ) and at two years (17.6% vs. 4.9%,  $p=0.004$ ).

Advanced heart failure was compared between the groups and was significantly more frequent in the high MMP-9 group at two-year follow-up (16.7% vs. 5.9%,  $p=0.015$ ).

High MMP-9 level was one of the independent predictors of two-year cardiovascular mortality (odds ratio: 3.5; 95% confidence interval: 1.12-11.35), together with age, no-reflow and left ventricular ejection fraction.

An interesting aspect of this study is that the no-reflow phenomenon during the procedure was significantly more frequent in the high MMP-9 group, since no-reflow may lead to cardiogenic shock, inotrope use or the need for IABP,

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development of advanced heart failure and ultimately cardiovascular mortality.

The authors recognize some limitations of their study. It was a single-center analysis of a relatively small number of patients, and the predictive value of MMP-9 was investigated using 12.92 ng/ml as a cut-off for their cohort, a different value from previous studies, and one that needs validation in other large populations.

Another issue is that all their patients were given clopidogrel rather than ticagrelor or prasugrel, so the precise effect of MMP-9 in MI patients who use newer antiplatelets cannot be determined.

In summary, high MMP-9 levels were an important predictor of major adverse cardiovascular events, including mortality and advanced heart failure, in two-year follow-up in STEMI patients undergoing primary PCI. MMP-9 measurement should therefore be considered as a prognostic marker for STEMI patients.

### Conflicts of interest

The author has no conflicts of interest to declare.

### References

1. Morrow DA, Antman EM, Charlesworth A, et al. TIMI risk score for ST-elevation myocardial infarction: a convenient, bedside, clinical score for risk assessment at presentation. *Circulation*. 2000;102:2031–7.
2. Timóteo A, Rosa S, Nogueira M, et al. ProACS risk score: an early and simple score for risk stratification of patients with acute coronary syndromes. *Rev Port Cardiol*. 2017;36:77–83.
3. Lindahl B, Toss H, Siegbahn A, et al. Markers of myocardial damage and inflammation in relation to long-term mortality in unstable coronary artery disease FRISC Study Group. *Fragmin during instability in coronary artery disease*. *N Engl J Med*. 2000;343:1139–47.
4. Blankenberg S, Rupprecht HJ, Poirier O, et al. Plasma concentrations and genetic variation of matrix metalloproteinase 9 and prognosis of patients with cardiovascular disease. *Circulation*. 2003;107:1579–85.
5. Jefferis BJ, Whincup P, Welsh P, et al. Prospective study of matrix metalloproteinase-9 and risk of myocardial infarction and stroke in older men and women. *Atherosclerosis*. 2010;208:557–63.
6. Dominguez-Rodriguez A, Abreu-Gonzalez P, Garcia-Gonzalez MJ, et al. High serum matrix metalloproteinase-9 level predict increased risk of in-hospital cardiac events in patients with type 2 diabetes and ST segment elevation myocardial infarction. *Atherosclerosis*. 2008;196:365–71.
7. Somuncu M, Pusuroglu H, Karakurt H, et al. The prognostic value of elevated matrix metalloproteinase-9 in patients undergoing primary percutaneous coronary intervention for ST-elevation myocardial infarction: a two-year prospective study. *Rev Port Cardiol*. 2020;39.