

Beyond Culprit Vessel Recanalization in Myocardial Infarction with ST-Segment Elevation

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The main objective of primary percutaneous coronary intervention (PCI) is to re-establish the patency of the infarct-related artery and to obtain reperfusion at the microvascular level as soon as possible after the onset of symptoms.¹ The angiographic assessment of myocardial blood flow is assessed by the Thrombolysis in Myocardial Infarction (TIMI) flow criteria, but up to half of patients with TIMI 3 flow after primary PCI do not achieve reperfusion at the microvascular level.^{2,3} A useful, simple, and inexpensive tool to assess microvascular reperfusion is the analysis of ST-segment resolution on the electrocardiogram (ECG) after reperfusion therapy in patients with ST-segment elevation myocardial infarction (STEMI), as recommended by the North American, European, and Brazilian guidelines.⁴⁻⁹ Initially used to assess reperfusion after thrombolysis and to guide the rescue PCI, the analysis of ST-segment resolution helps to reclassify the risk of the patient, especially in those with TIMI 3 flow after primary PCI.^{4,6,10-12}

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In this issue, Andrade et al.¹³ evaluated 61 patients who underwent primary PCI between March 2012 and July 2013, comparing their clinical and angiographic characteristics in relation to the resolution of the ST-segment, which occurred in one third of cases. The group of patients without ST-segment resolution showed higher heart rate, prevalence of diabetes mellitus, and chronic renal failure, and a tendency to longer ischemic time; mortality was also higher in these patients. Although the small number of patients prevented a more robust multivariate analysis, this is an important initiative in the search of a more elaborate result of a borrowed, easy to obtain and inexpensive outcome, indicating that similar trials are rare in our country.

The analysis of ST-segment resolution is performed by comparing the ECG performed between 60 and 90 minutes after reperfusion therapy and the baseline ECG, obtained at the time of STEMI diagnosis. Analysis by calculating the sum of ST-segment elevations in leads related to infarction and the analysis by the resolution of the lead with greater ST-segment elevation, as described below, are the methodologies most often cited in the literature:^{14,15}

- sum of ST-segment elevation: the elevation of the ST-segment is measured at the J-point (20 ms after the ST-segment), and the sum is performed according to the location of STEMI. For an anterior wall myocardial infarction, the ST-segment elevations in leads V1 to V6, I, and aVL are added. For an inferior wall infarction, the ST-segment elevations in leads II, III, aVF, V5, and V6 are added. The resolution rate of the sum of ST-segment elevations from baseline ECG, compared to post-reperfusion ECG, can be analyzed in two or three categories; 50% is the cut-off point for two categories (full resolution, $\geq 50\%$; and no resolution, $< 50\%$), and 70% is the cut-off point for three categories (full resolution, $\geq 70\%$; partial resolution, 30% to $< 70\%$; and absence of resolution, $< 30\%$).^{5,14}

- resolution of the ST-segment in the lead with higher elevation: calculated from the percentage of reduction in the elevation of the ST-segment from the baseline ECG, compared to post-reperfusion ECG, at the lead with the largest baseline ST-segment elevation. The resolution is analyzed in two (full resolution, $\geq 50\%$; and no resolution $< 50\%$) or three categories (full resolution, $\geq 70\%$; partial resolution, 30 to $< 70\%$; and no resolution, $< 30\%$).¹⁵

Recently, Buller et al.¹¹ prospectively compared six methods to calculate the ST-segment resolution in a cohort of 4,866 patients undergoing primary PCI. Among the

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tested methods, the isolated analysis of the lead with higher residual ST-segment elevation in post-PCI ECG showed prognostic ability at least equivalent to more complex methodologies. Furthermore, this methodology eliminates the analysis of basal ECG. Patients with residual ST-segment elevation ≥ 2 mm showed higher risk of cardiovascular events after 90 days, while patients with 1 to < 2 mm had an intermediate risk of events. The finding of a residual ST-segment elevation < 1 mm identified patients at low risk of events, regardless of the TIMI flow after primary PCI.

In short, the analysis of ST-segment resolution is an important prognostic indicator in the era of modern primary PCI, and is an important research tool in the evaluation of the outcome of these procedures. In daily clinical practice, this analysis has often been underused, probably due to lack of evidence-based interventions that can be adopted in patients with partial ST-segment resolution. New therapeutic modalities aimed at limiting the infarct extension, decreasing the reperfusion injury, and minimising the deleterious effects of distal micro-embolism, diffuse spasm, and inflammation remain as important goals to be pursued in patients undergoing primary PCI.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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