



## Distal Protection During Primary Percutaneous Coronary Intervention for ST-elevation Myocardial Infarction

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Primary percutaneous coronary intervention (PCI) is the standard treatment strategy for patients with ST-elevation myocardial infarction (STEMI). However, despite the early restoration of epicardial artery flow, microvascular obstruction and reduced myocardial perfusion may occur. The “no-reflow” phenomenon is associated with a large infarct size and poor outcomes. The pathogenesis of no-reflow phenomenon is multifactorial, which includes distal embolization, ischemia-reperfusion injury, and ischemic insult. There have been several attempts to prevent the no-reflow phenomenon. An early reperfusion to shorten the ischemic time is pivotal to attenuate the ischemic insult and prevent no-reflow; however, the role of adjunctive pharmacological intervention, such as human atrial natriuretic peptide, or mechanical intervention, such as remote-/post-conditioning, in preventing the reperfusion injury remains inconclusive.

During PCI, intracoronary thrombus and atherosclerotic plaques are crushed and streamed down the coronary artery. The atherothrombotic debris can be detected as high-intensity transient signals using a Doppler guide wire, immediately after the balloon deflation<sup>1)</sup>. No-reflow phenomenon may occur, if the size and number of emboli are large enough to obstruct the coronary microcirculation. A thrombus aspiration device was developed to reduce the thrombus burden that has the potency to become the source of emboli. Thrombus aspiration during PCI in Acute myocardial infarction Study (TAPAS) randomized 1,071 patients with STEMI to aspiration before stent-

ing and conventional PCI. It was reported in 2008 that thrombus aspiration improved the myocardial perfusion after PCI and reduced the rate of 1-year cardiac death or re-infarction<sup>2)</sup>. The ACC/AHA 2011 PCI guidelines and 2013 STEMI guidelines recommended thrombus aspiration as belonging to Class IIa<sup>3, 4)</sup>. However, in 2015 the Trial of Routine Aspiration Thrombectomy with PCI versus PCI Alone in Patients with STEMI (TOTAL) that randomized patients with 10,732 failed to show any clinical benefits of aspiration thrombectomy and rather showed higher incidences of stroke in the thrombectomy group<sup>5)</sup>. The 2015 STEMI guidelines modified the recommendations for aspiration thrombectomy, i.e., routine aspiration was classified as Class III and selective/bailout aspiration as Class IIb<sup>6)</sup>.

Distal protection prevents embolization of atherothrombotic debris during PCI. Filter-based devices are currently used, as they maintain perfusion during the procedure and have shown to be safe and effective in comparison to the balloon occlusion devices. PCI of saphenous vein graft (SVG) carries a significant risk of no-reflow, periprocedural MI, and adverse clinical events as the degenerated SVG lesions contain friable lipid-rich plaques. Saphenous vein graft Angioplasty Free of Emboli Randomized (SAFER) trial demonstrated that the use of distal protection device decreased the risk of PCI in SVG<sup>7)</sup>. The 2011 PCI guidelines recommend the distal (embolic) protection devices as Class I for SVG PCI. However, previous studies failed to show the efficacy of distal protection for native-artery PCI, even in patients with STEMI. Drug Elution and Distal Protection in ST-Elevation Myocardial Infarction (DEDICATION) trial randomly assigned 626 patients with STEMI to have PCI with or without distal protection. There was no difference in ST resolution, troponin/CK-MB levels, and left ventricular wall motion index<sup>8)</sup>. Moreover, there was a higher tendency toward re-MI and target lesion revascularization in patients with distal protection. Currently, routine use of distal protection has not been rec-

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ommended for patients with STEMI undergoing PCI.

In this issue of the journal, Teramoto *et al.* reviewed 164 patients with acute MI (mostly STEMI) who had undergone PCI and investigated the efficacy of distal protection<sup>9</sup>). They reported that the use of filter-based distal protection devices did not affect the incidences of complete ST resolution and peak CK; however, it was associated with lower incidences of heart failure (HF) during a 2-year follow-up. In previous studies, including DEDICATION trial, HF was not assessed. Although the underlying mechanism for this finding remains unclear, distal protection may be useful for some selected patients. The current study was not randomized, and the use of distal protection depended on the physician's decision. Distal protection device might have been used for patients who were more likely expected to receive the benefits. Previous studies using intracoronary imaging modalities, including intravascular ultrasound (IVUS), optical coherence tomography, and coronary angiography, have shown the lesion characteristics that are associated with no-reflow after PCI and hence may benefit from distal protection<sup>10</sup>). Although Teramoto *et al.* performed quantitative analysis of cross-sectional images of IVUS, longitudinal or qualitative analyses were not performed. Further studies need to be performed in order to clarify the clinical usefulness of distal protection in patients with STEMI undergoing PCI.

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