

Distal protection beneficial?

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The pathogenesis of acute coronary syndromes (ACS) includes the rupture or erosion of a coronary atherosclerotic plaque with variable degrees of superimposed platelet aggregation inducing a thrombus [1]. ST-elevation myocardial infarction (STEMI) is often caused by a total coronary occlusion of the atherothrombotic plaque, whereas in non-ST-elevation myocardial infarction (NSTEMI) the thrombus is mainly nonocclusive or transient occlusive causing less myocardial damage [2]. Conventional percutaneous coronary intervention (PCI) focuses on compressing the atherothrombotic plaque with the aim to normalize flow in the coronary artery and therefore restore perfusion of the ischemic myocardium [3]. However, embolization of atherothrombotic material may occur spontaneously after plaque rupture or due to mechanical crushing of the culprit lesion during PCI [4]. This results in obstruction of distal vessels or the microcirculation in the down-stream bed of the ischemia-related artery. Although normal epicardial flow may be achieved, this will lead to diminished myocardial perfusion, which is associated with larger

infarct size, diminished left ventricular ejection fraction and increased mortality [5]. Microvascular obstruction is frequently implicated as the underlying cause through the mechanism of embolization [6–8]. Distal protection devices (DPDs) can be used for transient distal balloon occlusion during PCI, and allow recovery of any liberated plaque by aspiration before restoration of the antegrade flow [9]. Whether myocardial function can be improved with DPDs compared with conventional PCI in patients with acute myocardial infarction (AMI) has still to be proven. Over the years, echocardiography [10–13] and CMR [14–37] have found a fixed niche in the setting of AMI. In particular CMR allows the visualization of infarct site and size whereby the identification of microvascular obstruction has become unique to CMR [38–40].

For echocardiography, there are limited data describing changes in cardiac function in DPDs studies, and no data describing changes in regional myocardial function. Tissue Doppler imaging (TDI) is a useful echocardiographic tool that permits quantitative and objective assessment of both global and regional function [41–43].

In the current issue of the International Journal of Cardiovascular Imaging, Duan et al. [44] assessed the effects of DPDs on global and regional LV systolic and diastolic function were assessed by TDI in 69 patients with anterior AMI, who were randomly assigned to either PCI with DPDs (DPD group, $n = 46$) or conventional PCI (control group, $n = 50$).

Editorial comment on the article of Duan et al.
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At 3- and 6-month follow-up, the DPD group showed a higher LV ejection fraction than the control group. Moreover, peak systolic and early diastolic mitral annular velocities obtained by TDI were significantly higher in the DPD group than in the control group. Lastly, the systolic and diastolic regional myocardial velocities were significantly improved in the DPD group compared to the control group. The authors concluded that patients with DPDs showed significant improvement of LV function. Especially patients with anterior AMI may benefit from DPDs during PCI.

In recent years various distal protection devices and thrombectomy devices have been developed to protect the microcirculation against embolization of atherothrombotic material and to improve myocardial reperfusion and LV function after PCI [45]. As the use of distal protection devices is still under debate, several trials in patients with STEMI have recently focused on thrombus aspiration [46–49]. These trials have clearly shown that thrombus aspiration improves myocardial reperfusion compared to conventional PCI. The largest study to date, the TAPAS-trial, showed that manual thrombus aspiration using the Export Aspiration Catheter (EAC) in patients with STEMI improves myocardial perfusion and one-year clinical outcome compared to conventional PCI [47]. As a consequence, thrombus aspiration has been included in the new European guidelines for patients with STEMI as a therapy to improve myocardial perfusion [50]. To conclude, the study of Duan et al. [44] lends support to the notion that distal protection may be beneficial in patients with STEMI.

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