

## Interventional Treatment of Nonculprit Lesions in Infarct-Related Cardiogenic Shock

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Approximately 70% to 80% of patients with cardiogenic shock subsequent to myocardial infarction (MI) present with multivessel disease.<sup>1</sup> These patients display higher mortality compared with patients with single-vessel disease.<sup>2</sup> While percutaneous coronary intervention (PCI) of the culprit lesion is established standard practice, the optimal management of additional nonculprit lesions has only recently been elucidated in the multicenter CULPRIT-SHOCK (Culprit Lesion Only PCI Versus Multivessel PCI in Cardiogenic Shock) trial. CULPRIT-SHOCK randomly assigned 706 patients who had multivessel disease, acute MI, and cardiogenic shock to 1 of 2 initial revascularization strategies: either PCI of the culprit lesion only, with the option of staged revascularization of nonculprit lesions, or immediate multivessel PCI.<sup>3</sup> There was a significant clinical benefit of a culprit lesion-only PCI strategy, with a reduction in the primary end point of 30-day mortality or renal replacement therapy, which was mainly driven by an absolute 8.2% reduction in 30-day mortality. The 30-day results of CULPRIT-SHOCK could recently be confirmed with a consistent reduction in the composite end point at 1-year follow-up for the culprit lesion-only PCI with possible staged revascularization strategy.<sup>4</sup> Results of the CULPRIT-SHOCK trial led to a change in the most recent European Society of Cardiology revascularization guidelines, which now advise against routine revascularization of non-infarct-related artery (non-IRA) lesions during primary PCI (class IIIB recommendation).<sup>5</sup>

In this issue of the *Journal of the American Heart Association (JAHA)*, Lee et al<sup>6</sup> now provide intriguing new longer-term data on the usefulness of non-IRA revascularization strategies in

infarct-related cardiogenic shock. A moderately high number of 659 patients from the nationwide, multicenter, prospective KAMIR-NIH (Korea Acute Myocardial Infarction–National Institutes of Health) registry were enrolled. All had ST-elevation myocardial infarction with cardiogenic shock and concomitant non-IRA stenosis. Multivessel PCI was performed in 260 patients and IRA-only PCI in 399 patients. At 3 years, patients in the multivessel PCI group had a lower risk of all-cause death and non-IRA repeat revascularization in adjusted analyses. Landmark analysis also demonstrated that the multivessel PCI group had a lower risk of recurrent MI and non-IRA repeat revascularization beyond 1 year compared with the IRA-only PCI group, while all-cause death was not significant. The results imply a potential benefit of non-IRA revascularization during the index hospitalization to improve long-term prognosis.

How do these new data fit in the context of the CULPRIT-SHOCK trial and the subsequent change in guideline recommendations?

Definitions must be put to the spotlight first. In the setting of infarct-related cardiogenic shock and multivessel disease, there are 3 principal PCI strategies: (1) PCI of the culprit lesion only, without further preplanned PCI of non-IRA lesions at any time point; (2) PCI of the culprit lesion only in the acute setting, with staged PCI at a later time point (either during the index hospitalization or thereafter; either unselectively or depending on clinical symptoms/evidence of ischemia); and (3) immediate ad hoc multivessel PCI of all significant lesions. For the sake of clarity, minor variations in any of these strategies or the option of coronary artery bypass surgery are disregarded.

The authors of the KAMIR-NIH registry defined the multivessel PCI group as patients who underwent either immediate non-IRA PCI (60%) or staged non-IRA PCI within the index hospitalization (40%); that is, patients from groups 2 and 3 above were mixed together. We believe it is not reasonable to do so, as the 2 PCI strategies are markedly different. It is likely at the time of the PCI of the culprit lesion where the risk but also the potential benefit of acutely improved hemodynamics by treating additional lesions will be the highest because of the clinically unstable situation, that there is much to gain and also much to lose. At a later time point during the hospital stay, the risk-benefit relationship of treating

The opinions expressed in this article are not necessarily those of the editors or of the American Heart Association.

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*J Am Heart Assoc.* 2019;8:e015045. DOI: 10.1161/JAHA.119.015045.

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additional lesions will be different. For the majority of patients, procedural risk will be lower, but as time has passed any acute benefit on shock hemodynamics will also likely be of lesser effect.

The CULPRIT-SHOCK trial distinctly used a different approach to group patients. Participants were randomized to either immediate multivessel PCI (of all significant lesions) or PCI of the culprit lesion only, with the option of staged revascularization of non-IRA lesions during the index hospitalization or soon thereafter. The CULPRIT-SHOCK trial explicitly did not ask investigators to leave significant lesions untreated at all. In other words, the KAMIR-NIH registry and CULPRIT-SHOCK trial set out to answer different questions.

While the KAMIR-NIH registry cannot delineate the differential impact of immediate versus staged PCI against no PCI of non-IRA lesions, it does have another clear and fundamental message: Significant additional lesions should not be left untreated altogether. Such conclusion is also supported by the recently published COMPLETE (Complete Versus Culprit-Only Revascularization to Treat Multi-vessel Disease After Early PCI for STEMI) trial of ST-elevation myocardial infarction patients with multivessel coronary artery disease yet without cardiogenic shock.<sup>7</sup> The study randomized patients who had undergone successful culprit lesion PCI to a strategy of either complete revascularization with routine staged PCI (either during or after the index hospitalization) or no further revascularization. Complete revascularization was superior to culprit lesion-only PCI in reducing the risk of cardiovascular death or MI, as well as the risk of cardiovascular death, MI, or ischemia-driven revascularization.

What is the current state of the art in PCI of non-IRA lesions in infarct-related cardiogenic shock? First, PCI should be confined to the culprit lesion in the acute emergency setting (with a pursuit of staged PCI of other significant nonculprit lesions at a later time point). Second, significant additional lesions should not be left untreated altogether.

Based on the new KAMIR registry results, the current guideline recommendation does not yet need an update.

## Disclosures

None.

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**Key Words:** Editorials • percutaneous coronary intervention • shock