Timing of Complete Revascularization in Patients With STEMI

Wood D, Cairns J, Wang J, et al. Timing of staged nonculprit artery revascularization in patients with ST-segment elevation myocardial infarction. J Am Coll Cardiol. 2019;74:2713-2723.

Study Overview

Objective. To determine the effect of the timing of nonculprit-lesion percutaneous coronary intervention (PCI) on outcomes in patients with ST-segment elevation myocardial infarction (STEMI).

Design. Planned substudy of an international, multicenter, randomized controlled trial blinded to outcome.

Setting and participants. Among 4041 patients with STEMI who had multivessel coronary disease, randomization to nonculprit PCI versus culprit-only PCI was stratified according to intended timing of nonculprit lesion PCI. A total of 2702 patients with intended timing of nonculprit PCI during the index hospitalization and 1339 patients with intended timing of nonculprit PCI after the index hospitalization within 45 days were included.

Main outcome measures. The first co-primary endpoint was a composite of cardiovascular (CV) death or myocardial infarction (MI).

Main results. In both groups, the composite endpoint of CV death or MI was reduced with complete revascularization compared to the culprit-only strategy (index hospitalization: hazard ratio [HR], 0.77, 95% confidence interval [CI], 0.59-1.00; after hospital discharge: HR, 0.69, 95% CI, 0.49-0.97; interaction, $P = 0.62$). Landmark analyses demonstrated a HR of 0.86 (95% CI, 0.59-1.24) during the first 45 days and 0.69 (95% CI,0.54-0.89) from 45 days to the end of follow-up for intended nonculprit lesion PCI versus culprit-lesion-only PCI.

Conclusion. Among patients with STEMI and multivessel disease, the benefit of complete revascularization over culprit-lesion-only PCI was consistent, irrespective of the investigator-determined timing of staged nonculprit lesion intervention.

Commentary

Patients presenting with STEMI often have multivessel disease.[1] Although the question of whether to revascularize the nonculprit vessel has been controversial, multiple contemporary studies have reported benefit of nonculprit-vessel revascularization compared to the culprit-only strategy.[2-5] Compared to these previous medium-sized randomized controlled trials that included ischemia-driven revascularization as a composite endpoint, the COMPETE trial was unique in that it enrolled a large number of patients and reported a benefit in hard outcomes of a composite of CV death or MI.[6]

As the previous studies point toward the benefit of complete revascularization in patients presenting with STEMI, another important question has been the optimal timing of nonculprit vessel revascularization. Operators have 3 possible options: during the index procedure as primary PCI, as a staged procedure during the index admission, or as a staged procedure as an outpatient following discharge. Timing of nonculprit PCI has been inconsistent in the previous studies. For example, in the PRAMI trial, nonculprit PCI was performed during the index procedure,[2] while in the CvPRIT and COMPARE ACUTE trials, the nonculprit PCI was performed during the index procedure or as a staged procedure during the same admission at the operator's discretion.[3,5]

In this context, the COMPLETE investigators report their findings of the prespecified substudy regarding the timing of staged nonculprit vessel PCI. In the COMPLETE trial, 4041 patients were stratified by intended timing of nonculprit lesion PCI (2702 patients during index hospitalization, 1339 after discharge), which was predetermined by the operator prior to the randomization. Among the patients with intended staged nonculprit PCI during index hospitalization, the incidence of the first co-primary outcome of CV death or MI was 2.7% per year in patients with complete revascularization, as compared to 3.5% per year in patients with culprit-lesion only PCI (HR, 0.77; 95% CI, 0.59-1.00). Similarly, in patients with intended nonculprit PCI after the index hospitalization, the incidence of the first co-primary outcome of CV death or MI was 2.7% per year in patients randomized to complete revascularization, as compared to 3.9% per year in patients with culprit-lesion-only PCI (HR, 0.69; 95% CI, 0.49-0.97). These findings were similar for the second co-primary outcome of CV death, MI, or ischemia-driven revascularization (3.0% vs 6.6% per year for intended timing of nonculprit PCI during index admission, and 3.1% vs 5.4% per year for intended timing of nonculprit PCI after discharge, both favoring complete revascularization).

The investigators also performed a landmark analysis before and after 45 days of randomization. Within the first 45 days, CV death or MI occurred in 2.5% of the complete revascularization group and 3.0% of the culprit-lesion-only PCI group (HR, 0.86; 95% CI, 0.59-1.24). On the other hand, during the interval from 45 days to the end of the study, CV death or MI occurred in 5.5% in the complete revascularization group and 7.8% in the culprit-lesion-only group (HR, 0.69; 95% CI, 0.54-0.89).

There were a number of strengths of the COMPLETE study, as we have previously described, such as multiple patients enrolled, contemporary therapy with high use of radial access, mandated use of fractional flow reserve for 50% to 69% stenosis lesions, and low cross-over rate.[7] In addition, the current substudy is unique and important, as it was the first study to systematically evaluate the timing of the staged PCI. In addition to their finding of consistent benefit between staged procedure before or after discharge, the results from their landmark analysis suggest that the benefit of complete revascularization accumulates over the long term rather than the short term.

The main limitation of the COMPLETE study is that it was not adequately powered to find statistical differences in each subgroup studied. In addition, since all nonculprit PCIs were staged in this study, nonculprit PCI performed during the index procedure cannot be assessed.

Nevertheless, the finding of similar benefit of complete revascularization regardless of the timing of the staged PCI has clinical implication for practicing interventional cardiologists and patients presenting with STEMI. For example, if the patient presents with hemodynamically stable STEMI on a Friday, the patient can potentially be safely discharged over the weekend and return for a staged PCI as an outpatient instead of staying extra days for an inpatient staged PCI. Whether this approach may improve the patient satisfaction and hospital resource utilization will require further study.

Applications for Clinical Practice

In patients presenting with hemodynamically stable STEMI, staged complete revascularization can be performed during the admission or after discharge within 45 days.

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References

1. Park DW, Clare RM, Schulte PJ, et al. Extent, location, and clinical significance of non-infarct-related coronary artery disease among patients with ST-elevation myocardial infarction. *JAMA.* 2014;312:2019-2027.

2. Wald DS, Morris JK, Wald NJ, et al. Randomized trial of preventive angioplasty in myocardial infarction. *N Engl J Med.* 2013;369:1115-1123.
3. Gershlick AH, Khan JN, Kelly DJ, et al. Randomized trial of complete versus lesion-only revascularization in patients undergoing primary percutaneous coronary intervention for STEMI and multivessel disease: the CvLPRIT trial. *J Am Coll Cardiol.* 2015; 65:963-972.
4. Engstrom T, Kelbaek H, Helqvist S, et al. Complete revascularisation versus treatment of the culprit lesion only in patients with ST-segment elevation myocardial infarction and multivessel disease (DANAMI-3-PRIMULTI): an open-label, randomised controlled trial. *Lancet.* 2015;386(9994):665-671.
5. Smits PC, Abdel-Wahab M, Neumann FJ, et al. Fractional flow reserve-guided multivessel angioplasty in myocardial infarction. *N Engl J Med.* 2017;376:1234-1244.
6. Mehta SR, Wood DA, Storey RF, et al. Complete revascularization with multivessel pci for myocardial infarction. *N Engl J Med.* 2019;381:1411-1421.
7. Hirai T, Blair JEA. Nonculprit lesion PCI strategies in patients with STEMI without cardiogenic shock. *J Clin Outcomes Management.* 2020;27:7-9.