

Open Access

Staged Complete Revascularization in ST-Segment Elevation Myocardial Infarction Should Be the Treatment of Choice Compared to Primary Complete Revascularization

Do-Sun Lim, MD

Department of Cardiology, Cardiovascular Center, Korea University College of Medicine, Anam Hospital, Seoul, Korea

Refer to the page 718-725

Coronary artery disease is a diffuse process, and patients presenting with ST-segment elevation myocardial infarction (STEMI) have multiple lesions that may be suitable for percutaneous coronary intervention (PCI). The best strategy regarding PCI for STEMI in multivessel disease is an unresolved issue. Although current guidelines recommend that PCI in non-culprit arteries should not be attempted unless the patient is hemodynamically unstable,^{1,2)} it is uncertain whether PCI of the infarct-related artery only or a strategy of complete revascularization, either in a simultaneous or staged multivessel PCI approach, will improve outcome.

In contemporary medical therapy, it is not clear whether intervening to treat stable chronic nonculprit lesions in patients with STEMI can prevent major adverse cardiovascular events. Moreover, multivessel stenting in this setting could potentially be associated with greater contrast usage and periprocedural myocardial infarction secondary to side branch closure and distal embolization.³⁾

In this Korean Acute Myocardial Infarction Registry-Based Analysis (KAMIR)-based study,⁴⁾ we compared the clinical outcomes of multivessel revascularization vs. those of infarct-related artery (IRA)-only revascularization in patients undergoing primary PCI for STEMI. Although this was a retrospective study, 1,094 STEMI patients were analyzed, and this is one of the largest data collections regarding STEMI patients in Korea. There were no significant differences between the 2

groups in terms of death, myocardial infarction, or revascularization. However, when the complete primary revascularized patients were compared with the incomplete primary revascularized patients, the non-target vessel revascularization rate was significantly higher in the incompletely revascularized patients when compared with the completely revascularized group (8.6 vs. 1.8%, $p=0.002$). This seems obvious considering the fact that other non-target vessels in the incomplete revascularized group could cause significant ischemia, thereby requiring subsequent procedures. However, complete primary revascularization itself has multiple risks which could be fatal to the patients, such as acute stent thrombosis, side branch occlusion, and distal embolization.

Based on available data, PCI of the culprit lesion has the advantages of shorter procedure duration, a smaller amount of dye used, and a lower rate of periprocedural myocardial infarctions, while complete revascularization has lower rates of recurrent angina and a better left ventricular ejection fraction. Although available data provide controversial results concerning the right strategy to choose, a strategy of multivessel PCI should be pursued considering the timing of complete revascularization. Patients with STEMI are in a heightened thrombotic and inflammatory state and may be more prone to the adverse effects of multivessel PCI.^{5,6)} Furthermore, multivessel disease is associated with increased in-stent restenosis, and placing of multiple stents may be associated with increased revascularization secondary to in-stent restenosis.⁷⁾ The safety and efficacy of multivessel PCI was examined in a subpopulation of the Treat angina with Aggra-

Correspondence: Do-Sun Lim, MD, Department of Cardiology, Cardiovascular Center, Korea University College of Medicine, Anam Hospital, 73 Incheon-ro, Seongbuk-gu, Seoul 136-705, Korea
Tel: 82-2-920-5445, Fax: 82-2-927-1478, E-mail: dslmd@kumc.or.kr

• The author has no financial conflicts of interest.

© This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/3.0>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

stat and determine Cost of Therapy with an Invasive or Conservative Strategy-Thrombolysis in Myocardial Infarction-18) trial. Of the 290 patients with multivessel disease, 224 underwent culprit lesion and 66 underwent multivessel stenting.⁸⁾ There were no significant differences for the 6-month composite end points of death or MI, which were similar to the KAMIR data.⁸⁾ After comparing all the risks and benefits of complete revascularization, staged complete revascularization should be the treatment of choice in patients with STEMI.

The KAMIR study has several limitations. First, it was an observational study. Second, the attitude of the operator and the progression of the procedure are very important, but very difficult to measure in an observational study. Third, individuals who undergo multivessel PCI may receive more follow-up procedures. These differences would most likely lead to more revascularization in patients with multivessel PCI. Finally, the KAMIR data did not include contrast volume and fluoroscopy time.

In a large cohort of KAMIR patients with STEMI undergoing PCI, nonculprit multivessel drug-eluting stenting was associated with a lower incidence of non-target vessel revascularization, thereby reducing the rates of MACE in the complete primary revascularization group. However, complete primary revascularization should be carefully considered in patients with hemodynamically stable STEMI, because multivessel drug-eluting stenting could potentially have adverse effects secondary to increased contrast load and side branch closure, leading to renal failure and periprocedural MI, respectively.⁹⁾ To avoid the potential risks of simultaneous multivessel PCI, a strategy of staged complete revascularization appears to be the best choice. Current guidelines should be reevaluated to account for these considerations. Adequately powered randomized controlled trials should be performed to endorse current knowledge.

REFERENCES

- 1) Smith SC Jr, Feldman TE, Hirshfeld JW Jr, et al. ACC/AHA/SCAI 2005 guideline update for percutaneous coronary intervention: summary article: a report of the American College of Cardiology/American Heart Association Task Force on practice guidelines (ACC/AHA/SCAI Writing Committee to update the 2001 guidelines for percutaneous coronary intervention). *Circulation* 2006;113:156-75.
- 2) Smith SC Jr, Feldman TE, Hirshfeld JW Jr, et al. ACC/AHA/SCAI 2005 guideline update for percutaneous coronary intervention: a report of the American College of Cardiology/American Heart Association Task Force on practice guidelines (ACC/AHA/SCAI Writing Committee to Update 2001 guidelines for percutaneous coronary intervention). *Circulation* 2006;113:e166-286.
- 3) Varani E, Balducelli M, Aquilina M, et al. Single or multivessel percutaneous coronary intervention in ST-elevation myocardial infarction patients. *Catheter Cardiovasc Interv* 2008;72:927-33.
- 4) Jo HS, Park JS, Sohn JW, et al. Culprit-lesion-only versus multivessel revascularization using drug-eluting stents in patients with ST-segment elevation myocardial infarction: a Korean Acute Myocardial Infarction Registry-Based Analysis. *Korean Circ J* 2011;41:718-25.
- 5) Kornowski R, Mehran R, Dangas G, et al. Prognostic impact of staged versus "one-time" multivessel percutaneous intervention in acute myocardial infarction: analysis from the HORIZONS-AMI (harmonizing outcomes with revascularization and stents in acute myocardial infarction) trial. *J Am Coll Cardiol* 2011;58:704-11.
- 6) Hannan EL, Samadashvili Z, Walford G, et al. Culprit vessel percutaneous coronary intervention versus multivessel and staged percutaneous coronary intervention for ST-segment elevation myocardial infarction patients with multivessel disease. *JACC Cardiovasc Interv* 2010;3:22-31.
- 7) Vlaar PJ, Mahmoud KD, Holmes DR Jr, et al. Culprit vessel only versus multivessel and staged percutaneous coronary intervention for multivessel disease in patients presenting with ST-segment elevation myocardial infarction: a pairwise and network meta-analysis. *J Am Coll Cardiol* 2011;58:692-703.
- 8) Brener SJ, Murphy SA, Gibson CM, DiBattiste PM, Demopoulos LA, Cannon CP. Efficacy and safety of multivessel percutaneous revascularization and tirofiban therapy in patients with acute coronary syndromes. *Am J Cardiol* 2002;90:631-3.
- 9) Shishehbor MH, Lauer MS, Singh IM, et al. In unstable angina or non-ST-segment acute coronary syndrome, should patients with multivessel coronary artery disease undergo multivessel or culprit-only stenting? *J Am Coll Cardiol* 2007;49:849-54.