

LETTERS TO THE EDITOR

Challenges in Retrospective Analysis of PCI Data in Critically Ill Patients

We read with great interest the paper by Mylotte et al. (1) in *JACC: Cardiovascular Interventions*, which reports the efficacy of multivessel primary percutaneous coronary intervention (MV-PCI) and compares it with that of culprit-only PCI in patients with ST-segment elevation myocardial infarction presenting with cardiogenic shock and resuscitated cardiac arrest. The investigators suggested that complete up-front revascularization with MV-PCI has the potential to improve outcomes in critically ill patients. However, a few issues regarding the interpretation of their data come to mind.

The study is limited by an obvious patient selection bias. Because the study was a retrospective analysis of prospectively collected data, all decisions regarding the PCI were solely at the discretion of the treating physician. The lesional and procedural factors such as lesion difficulty (included the infarct-related artery [IRA] and non-IRA), expected procedure time, and operator's skill level have the potential to influence the results. For example, anatomically, the MV-PCI group may have included "PCI-favorable" cases, and this may have led to a better patient outcome compared with that for the culprit-only PCI group. Obviously, the patients with complex "PCI-unfavorable" lesions have a worse prognosis compared with that of patients with simple lesions (2). In the present study, the lesion complexity of the IRA and non-IRA between the 2 groups was not clear. Adjustment with variables that reflect lesion complexity (e.g., the prevalence of type-C or chronic total occlusion lesions) might be helpful (3). Additionally, the differences in the devices that were used for intervention during the more than 10-year period (1998 to 2010) may have affected the outcomes. These differences may have occurred because of various factors, including improvements in guidewire flexibility and the stent delivery system. It may be helpful to determine whether the favorable outcome in the MV-PCI group compared with that in the culprit-only PCI group was consistent during the time of the study. We believe that the clarification of these 2 points would further assist in validating this important study.

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REFERENCES

1. Mylotte D, Morice MC, Eltchaninoff H, et al. Primary percutaneous coronary intervention in patients with acute myocardial infarction, resuscitated cardiac arrest, and cardiogenic shock: the role of primary multivessel revascularization. *J Am Coll Cardiol Intv* 2013;6:115–25.
2. Webb JG, Sanborn TA, Sleeper LA, et al., for the SHOCK Investigators. Percutaneous coronary intervention for cardiogenic shock in the SHOCK Trial Registry. *Am Heart J* 2001;141:964–70.
3. Baber U, Kini AS, Sharma SK. Stenting of complex lesions: an overview. *Nat Rev Cardiol* 2010;7:485–96.

Reply

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We thank Dr. Endo and colleagues for their interest in our study (1). They correctly note that the absence of a pre-determined revascularization strategy in this nonrandomized analysis confers the potential for patient selection or treatment bias. This implies that when selecting patients for primary multivessel percutaneous coronary intervention (MV-PCI), the treating physicians may have cherry picked "better" cases for more complete revascularization. Although it is likely that a more complete upfront revascularization strategy was not performed in some patients due to perceived futility, clinical experience and prior observational studies suggest that it is higher-, rather than lower-risk patients that are more likely to be selected for more complete emergent revascularization (2,3). In our study, the baseline characteristics among the groups were well matched, and indeed, complex (left main and bifurcation) infarct-related artery (IRA) lesions were more common in patients undergoing MV-PCI than in those undergoing culprit-only PCI (CO-PCI). Furthermore, non-IRA chronic occlusions were equally pervasive in both groups. Dr. Endo correctly surmises that successful primary MV-PCI is determined by both anatomical complexity and physician experience. These factors should be considered when determining the appropriateness of primary MV-PCI.

Dr. Endo and colleagues also suggest that temporal changes in patient outcome may be expected in studies of extended length such as ours. We dichotomized the entire patient cohort (N = 266) according to the era of treatment: Group A: 1998 to 2004; and Group B: 2004 to 2010. The proportion of patients with multivessel disease (62.9% vs. 64.2%, p = 0.90) and treated with MV-PCI (24.5% vs. 25.2%, p = 0.99) was similar. In addition, there was no difference in the rates of PCI success over time (81.1% vs. 84.6%, p = 0.52). By contrast, thrombus aspiration (18.3% vs. 61.7%, p < 0.0001) and therapeutic hypothermia (10.5% vs. 24.4%, p = 0.003) were more frequently applied in the more recent cohort. Numerically, 6-month survival was higher in the contemporary cohort, though this was not statistically significant (30.8% vs. 39.0%, p = 0.96) due to small patient numbers. As previously stated, the inherent limitations

of our observational study render the conclusions to be hypothesis generating, and highlight the need for appropriately powered prospective randomized trials on this most important subject.

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REFERENCES

1. Mylotte D, Morice MC, Eltchaninoff H, et al. Primary percutaneous coronary intervention in patients with acute myocardial infarction, resuscitated cardiac arrest, and cardiogenic shock: the role of primary multivessel revascularization. *J Am Coll Cardiol Intv* 2013;6:115-25.
2. Cavender MA, Milford-Beland S, Roe MT, Peterson ED, Weintraub WS, Rao SV. Prevalence, predictors, and in-hospital outcomes of non-infarct artery intervention during primary percutaneous coronary intervention for ST-segment elevation myocardial infarction (from the National Cardiovascular Data Registry). *Am J Cardiol* 2009;104:507-13.
3. Bauer T, Zeymer U, Hochadel M, et al. Use and outcomes of multivessel percutaneous coronary intervention in patients with acute myocardial infarction complicated by cardiogenic shock (from the EHS-PCI Registry). *Am J Cardiol* 2012;109:941-6.

Asymptomatic Cerebral Lesions After Carotid Artery Stenting May Not Predict Future Cerebrovascular Events But May Be Associated With Cognitive Impairment

The paper by Bijuklic et al. (1) in *JACC: Cardiovascular Interventions* evaluated the impact of new asymptomatic cerebral ischemic lesions in diffusion-weighted magnetic resonance imaging (DW-MRI) after carotid artery stenting (CAS). New post-procedural asymptomatic cerebral ischemic lesions on DW-MRI were

demonstrated in 241 of 728 CAS patients (32.8%). By multivariate Cox regression analysis, a positive cerebral DW-MRI after CAS had no prognostic impact on major adverse cerebral and cardiovascular events (1).

The investigators mention that 1 limitation of their study is that they did not perform any neuropsychological testing (1). This limitation was addressed in another recent paper (2). In this study, 37 patients scheduled to undergo CAS underwent brain DW-MRI and neuropsychological evaluation before, as well as after, the procedure. At least 1 new post-procedural asymptomatic cerebral ischemic lesion on DW-MRI was detected in 9 of 37 patients (24%). It was demonstrated that CAS-induced new post-procedural asymptomatic cerebral ischemic lesions on DW-MRI had a negative impact on cognitive functions as assessed by the following verbal memory tests (2): Mini-Mental State Examination (MMSE; mean MMSE change: -1.5; 95% confidence interval [CI]: from -2.8 to -0.2 vs. +0.5; 95% CI: from -0.3 to +1.3, for patients with vs. without new ischemic lesions on DW-MRI; $p = 0.017$); the Rey Auditorial Verbal Learning Test-Immediate (RAVLT-I); RAVLT-I scores: 31.6 ± 8.8 vs. 39.9 ± 5.6 , for patients with vs. without new ischemic lesions on DW-MRI; $p = 0.003$); and the RAVLT-Delayed (RAVLT-D); RAVLT-D scores: 6.1 ± 1.6 vs. 7.9 ± 1.6 , for patients with vs. without new ischemic lesions on DW-MRI; $p = 0.015$). As correctly mentioned by the investigators, this is the first report showing an association between asymptomatic cerebral lesions on DW-MRI and cognitive functions (2).

Although asymptomatic cerebral lesions in DW-MRI after CAS may not predict future major adverse cerebral and cardiovascular events (1), preliminary evidence suggests that these lesions may have a negative impact on cognitive functions (2). Furthermore, it has been suggested that, compared with carotid endarterectomy, CAS is associated with higher microembolization rates (3). Future studies should investigate the impact of asymptomatic cerebral lesions in DW-MRI on future major adverse cerebral and cardiovascular events and cognitive functions after CAS compared with carotid endarterectomy.

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REFERENCES

1. Bijuklic K, Wandler A, Tübler T, Schofer J. Impact of asymptomatic cerebral lesions in diffusion-weighted magnetic resonance imaging after carotid artery stenting. *J Am Coll Cardiol Intv* 2013;6:394-8.
2. Maggio P, Altamura C, Landi D, et al. Diffusion-weighted lesions after carotid artery stenting are associated with cognitive impairment. *J Neurol Sci* 2013;328:58-63.