JACC: CARDIOVASCULAR INTERVENTIONS
VOL. 6, NO. 2, 2013

ISSN 1936-8798/$36.00
PUBLISHED BY ELSEVIER INC.
http://dx.doi.org/10.1016/j.jcin.2012.11.002

EDITORIAL COMMENT

ST-Segment Elevation Myocardial Infarction, Cardiac Arrest, and Cardiogenic Shock

An Interventional Triumvirate of Opportunity*

Karl B. Kern, MD

Tucson, Arizona

Cardiogenic shock following myocardial infarction remains a significant clinical challenge. Newly reported 30-day mortality rates remain in the 40% range and are not affected by the use of intra-aortic balloon counterpulsation (1). Few cardiac conditions are more deadly. The major exception is patients who suffer cardiac arrest with their ST-segment elevation myocardial infarction (STEMI) and, once resuscitated, manifest cardiogenic shock. Garot et al. (2) from Paris have shown that such patients have a 6-month mortality of 67%. In this post–cardiac arrest population, multiple stepwise logistic regression analysis showed the absence of shock on admission to be independently associated with improved 6-month survival (odds ratio [OR]: 12.66, 95% confidence interval [CI]: 3.39 to 47.63) (2). In a separate report, Mooney et al. (3) found similar poor outcomes among those resuscitated from cardiac arrest with subsequent cardiogenic shock. In their series of 140 patients resuscitated from out-of-hospital cardiac arrest, 61 (44%) manifested cardiogenic shock. Post–cardiac arrest patients with shock had a significantly higher in-hospital mortality rate than those without (62% vs. 30%; OR: 0.26, 95% CI: 0.13 to 0.53).

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Mylotte and these same Parisian investigators (4) report in this issue of *JACC: Cardiovascular Interventions* their remarkable experience in treating this very sick post-resuscitation population with cardiogenic shock. Between 1998 and 2010, Mylotte et al. conducted a multicenter, prospective, data collection of consecutive, unselected patients presenting with STEMI. Among these 11,530 STEMI patients, 496 (4.3%) were resuscitated from cardiac arrest. The cohort for their reported observational study included 272 patients who manifested cardiogenic shock after being resuscitated. Most of these patients (174) were found to have multivessel coronary artery disease. Among the patients with multivessel disease, 2 revascularization approaches were compared: culprit-only or multivessel primary percutaneous coronary intervention (PCI). Survival at 6 months was significantly greater in patients undergoing multivessel PCI than in those treated with culprit vessel PCI only (43.9% vs. 20.4%; $p < 0.002$).

Though obviously not a prospective, blinded, or randomized trial, these results are consistent with the growing database of cohort studies showing remarkable outcome improvements with more aggressive post-resuscitation care.

Sunde et al. (5) were the first to report their experience with more aggressive post-resuscitation care improving long-term survival after cardiac arrest. They doubled their historical survival to discharge with favorable neurological outcome rate from 26% to 56%. The most important post–cardiac arrest treatments were therapeutic hypothermia and early coronary angiography. The literature now reports the outcomes of over 1,500 cardiac arrest patients so treated after successful resuscitation (6). This worldwide experience shows that aggressive post-resuscitation care is achievable, safe, and beneficial in those suffering cardiac arrest in the context of STEMI (2,7–10), non-STEMI (11–13), and now STEMI with associated cardiogenic shock (4). Not only was 6-month survival better with full revascularization by multivessel PCI, but remarkably 90% of those who survived had favorable neurological recovery (4).

Mylotte et al. achieved remarkable outcomes in this, the very highest risk subgroup of all STEMI patients (4). Maynard et al. (14) from Seattle showed the high risk associated with such patients using a mortality model based on the nearly 16,000 consecutive PCI in Washington state. The overall mortality rate was 1%, whereas the mortality rate in post-resuscitated patients was 19%. Interestingly, in their analysis, compared with post-resuscitation status, only cardiogenic shock had a higher OR for predicting death post-PCI. Manifesting cardiogenic shock after resuscitation from cardiac arrest combines these 2 highest-risk conditions for death after STEMI.

Mylotte et al. (4) publish the first data substantiating the concept that a complete revascularization, as opposed to a culprit-only strategy in those with cardiogenic shock, can improve outcome. Though such a strategy has been espoused previously, this is the first clinical evidence of efficacy for this approach. Perhaps they were successful in showing such an improvement because of the very high-risk population studied.

*Editorials published in *JACC: Cardiovascular Interventions* reflect the views of the authors and do not necessarily represent the views of *JACC: Cardiovascular Interventions* or the American College of Cardiology.

From the Division of Cardiology, University of Arizona, Sarver Heart Center, Tucson, Arizona. Dr. Kern has received honoraria as a consultant for Zoll Medical and PhysioControl.

Calculating the observed-to-expected ratio for death from their recent experience in treating those with STEMI complicated by cardiac arrest and then cardiogenic shock is revealing (4). According to their earlier report, the expected mortality in such patients is 67%. These investigators from Paris found that multivessel PCI performed immediately upon arrival at the hospital improved outcome, lowering the mortality rate to 56%, thereby achieving an observed-to-expected ratio of 0.84 ($p < 0.03$). This approach works in these very sick patients!

Once again these pioneers from Paris are leading the way. They have reset the bar in treating the "sickest of the sick" among cardiac patients. Hopefully, such therapy can be extended to all post–cardiac arrest patients, not just in Paris, but in other communities as well. This will likely only occur when we recognize the importance of complete, emergency revascularization in this very sick subgroup of STEMI patients.

Reprint requests and correspondence: Dr. Karl B. Kern, Division of Cardiology, University of Arizona, Sarver Heart Center, 1501 North Campbell Avenue, Tucson, Arizona 85724. E-mail: kernk@email.arizona.edu.

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Key Words: cardiac arrest ■ percutaneous coronary intervention ■ ST-segment elevation myocardial infarction.