



NSTEMI: Not Just a ‘Small Heart Attack’



George W. Vetrovec *

VCU Pauley Heart Center, Virginia Commonwealth University, Richmond, Virginia

* 3126 W. Cary St. #693, Richmond, Virginia 23221-3504.

The optimal management of non-ST segment elevation myocardial infarction (NSTEMI) remains elusive. That is unfortunate for this population, which has significant risk of early and late adverse outcomes, a fact that is often underappreciated. Acute coronary syndrome (ACS) is the broad category that includes acute myocardial infarction (AMI) and unstable angina (UA) [1–3]. NSTEMI represents up to 70% of patients presenting with ACS [4,5]. Furthermore, the incidence of ST-elevation myocardial infarction (STEMI) events has been dropping over the past 10 years, while for NSTEMI, the incidence has declined minimally. NSTEMI patients tend to be older and sicker, with higher risks of adverse events such as cardiogenic shock, than STEMI patients. Furthermore, there remains considerable variation in treatment management for NSTEMI patients [6]. Thus, NSTEMI remains an increasingly important target as we attempt to reduce the incidence while improving outcomes for patients presenting with NSTEMI.

Multiple factors [7–11] contribute to these disparate approaches and varying results. First, the NSTEMI population is clinically diverse. Despite NSTEMI often being thought of as “a little heart attack,” databases repeatedly inform us that NSTEMI patients with varied high-risk features, such as complex and extensive anatomic coronary disease, left ventricular dysfunction, renal failure, advanced age, and a greater risk of developing or presenting with cardiogenic shock. Simply, NSTEMI patients tend to be a higher-risk population. Furthermore, up to half of NSTEMI patients do not exhibit chest pain, compared to about one-fourth of STEMI patients. The lack of chest pain increases the diagnostic time for patients [12].

A second factor is inconsistency in guideline management. This may again be a result of the “small MI” concept. Also complicating early invasive management has been some ambiguity in the benefits of an early invasive approach. Current data based on the VERDICT trial [13] suggest that a very early invasive coronary evaluation, as opposed to an invasive evaluation within 2 or 3 days, is only advantageous in high-risk cases, defined by a GRACE score >140. In contrast, STEMI care has been more

defined and lower risk with a more direct target – open the culprit artery. While we have learned that there is a benefit to more complete revascularization in STEMI, many patients don't require complex intervention. In contrast, the often more extensive and complex coronary anatomy in NSTEMI patients, who also are more likely to have serious comorbidities such as advanced age, a low left ventricular ejection fraction (LVEF), and a higher risk of developing cardiogenic shock than STEMI patients, represents a challenge for low-volume operators. Low-volume operators often perform percutaneous coronary interventions (PCIs): 44% of PCIs in the US are done by operators doing fewer than 50 procedures per year, and just over 70% of PCIs are done by operators performing fewer than 100 per year. [14] Lower-volume operators tend to operate at lower-volume hospitals, do more emergency (presumably more STEMI) cases, use greater contrast and fluoroscopy, and perform more new dialysis after the procedure. Thus, the reality of the performance of PCI across the expanse of the US may contribute to our often-disparate approach to PCI in NSTEMI.

In this issue of *Cardiovascular Revascularization Medicine*, Subahi et al. [15] remind readers that the NSTEMI population has unique risk features, particularly related to congestive heart failure (CHF). The authors focus on the significance of CHF as a predictor of adverse outcomes in NSTEMI. Using a National Inpatient Sample (NIS) database for 2010–2014, the authors identified a population of 247,624 patients who presented with NSTEMI. CHF was identified in 84,115 (34%) of patients. Overall, NSTEMI patients with CHF had less revascularization than patients without CHF: PCI, 20.48% vs. 40.9%, $p < 0.001$; CABG, 8.2% vs. 9.6%, $p < 0.001$. NSTEMI patients had longer hospital lengths of stay and more frequent in-hospital adverse outcomes. Using propensity matching, CHF was the strongest predictor of in-hospital death (RR 1.27; 95% CI 1.22 to 1.33). While there are limits to the granularity of an analysis from an NIS database, it is interesting to postulate why CHF carries this degree of risk. The authors note the potential for greater diastolic dysfunction because of greater ischemia, more diabetes, and

renal failure. Specific LVEF values are not available. However, another factor may relate to a greater number of elderly and female patients in the CHF population; both elderly and female patients are more likely to have “atypical” ischemic symptoms, which may be because of the ischemic issues noted or secondary to other neurohumoral differences. Alternatively, dyspnea in the absence of chest pain may reduce the intensity and time to early treatment, which may also play a role in worse outcomes. All of these factors, including an appropriate limited treatment response in the frail elderly population, probably play a role. However, despite these caveats, the major “take home” message is that the CHF cohort is sicker, has greater anatomic and clinical risk factors, undergoes less revascularization, and has worse outcomes.

Would more aggressive revascularization and treatment in general improve outcomes for CHF patients with NSTEMI? Perhaps. Dondo [6] showed that greater adherence to guideline therapy is associated with improved late outcomes, particularly in the highest-risk cases. The interventional and, when necessary, surgical skills exist to treat high-risk patients effectively, albeit with reasonable risk. There are experienced, so-called complex high-risk and indicated PCI (CHIP), operators [16]. As shown in PROTECT II [17], hemodynamic support for high-risk anatomy was associated with improved outcomes in both late major adverse cardiovascular and cerebrovascular events, LVEF improvement, and even potentially for the renal risk of PCI [18,19]. Given that these high-risk NSTEMI patients are often elderly, the foremost requirement is dedicating advanced therapy to patients who wish to undergo the procedure(s) and who are not excessively frail. Second, using best-option strategies for revascularization with best-practice techniques is critical for optimal results. The use of the Heart Team model is appropriate to assure the best decisions. There remains at least one problem: the maldistribution of operators and, perhaps, surgeons experienced in managing high-risk procedures in some, often smaller, centers. There is a need to develop greater skills and practice decisions [14,20] among lower-volume operators and to strengthen referral networks to regional, larger-volume centers. Furthermore, enhanced data analyses from real-world registries will be imperative to understand what works, when as well as why.

Optimal treatment of NSTEMI represents a significant challenge that the cardiovascular community has not fully accepted. These issues are important if we are to address the ever-increasing, more-complex ACS population presenting with NSTEMI, who are at higher risk for cardiogenic shock, other in-hospital complications, and death. Importantly, effectively treating NSTEMI patients provides an opportunity to improve outcomes while potentially reducing the high hospital costs of this population.

It's time we take the challenge to improve the outcomes for “small heart attacks.”

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