The Growing Burden of Perioperative Heart Failure

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Each year, over 2 million patients are admitted to hospitals with some form of congestive heart failure (HF). It is estimated that the current prevalence of HF is over 5.8 million in the United States and over 23 million worldwide.[1] Over half a million new cases are diagnosed every year in the United States, and the chance of developing HF in a lifetime is 1 in 5.[2,3] A diagnosis of HF independently increases the risk of death, and HF is noted on 1 in 8 death certificates. In the Framingham Heart Study, a new diagnosis of HF carried an approximate 30-day mortality of 10%, while the 1-year mortality approaches 30%.[3] HF is predominantly a geriatric disease: 80% of the HF deaths occur in individuals aged ≥65 years.[4,5] HF is known to be a major risk factor in perioperative medicine[6] and is seen in 2.5% to 10% of noncardiac surgical patients.[7–9] Advances in medical care allow people to live longer with more comorbidity, such that patients with HF are often hospitalized for other conditions. The patients with HF listed on the discharge summary are often being treated for other illnesses; chronic obstructive pulmonary disease, chronic renal failure, and cancer are prime examples.[10,11]

HF can be broadly categorized into 2 major subgroups: those with abnormal and those with preserved systolic function. This designation matters little to outcome because cohort studies show the same short- and long-term mortality rates.[12] In HF with preserved left ventricular ejection fraction (LVEF), patients frequently have evidence of diastolic dysfunction, and HF can occur due to impaired ventricular relaxation, requiring elevated filling pressures to obtain normal left ventricular (LV) end-diastolic volumes. Diastolic dysfunction is common in HF patients where over 20% had mild and 7% had moderate while <1% had severe diastolic dysfunction.[13] In comparison, only 6% of HF patients have an ejection fraction of <50%, and <2% have severe systolic dysfunction (LVEF <40%). In the past, we have been critical of the routine preoperative use of screening echocardiograms.[14] Clearly, however, patients with new onset or with worsening symptoms would benefit from a preoperative echocardiogram to obtain high-quality studies of both systolic and diastolic function. By focusing on systolic function alone, we will severely underestimate the risk of adverse outcomes in a majority of our patients.

In this issue of *Anesthesia & Analgesia*, Maile et al.[15] from the University of Michigan address the growing burden of HF and its impact on outcomes after elective noncardiac surgery. Using the American College of Surgeons National Surgical Quality Improvement Program (NSQIP) database, they investigated the association between worsening HF and morbidity/mortality. In this multicenter cohort study, they found that <1% of elective surgical patients have NSQIP-defined HF. The investigators then used a nonparsimonious propensity score to match patients with HF to those without HF. They found that this definition of HF was associated with a doubled mortality rate compared with a similar cohort but without the NSQIP definition of HF. In addition, this analysis found that renal complications (renal insufficiency and acute renal failure), respiratory complications (need for unplanned intubation, prolonged mechanical ventilation, pneumonia), sepsis, and cardiac arrests were more frequent in patients with HF. Interestingly, this analysis could not find an association between HF and an increased frequency of postoperative myocardial infarction (MI).

Maile et al.[15] have added important information to our existing knowledge base by drawing attention to a very high postoperative complication rate that is, in this instance noncardiac, in excess of 30%. The mortality rate is similarly excessive and approaches 10%. The focus of past HF cohort studies had been on cardiac complications.[16] Indeed, a history of HF has been repeatedly demonstrated to be an important predictor of postoperative cardiac complications.[8,17,18] Now this study draws attention to the as yet unappreciated high incidence of noncardiac complications as well. Increased rates of sepsis and pneumonia are key and novel findings.

As the title suggests, and in contradistinction to the above referenced studies,[8,17,18] the present report was not able to detect a difference in the rates of postoperative MI. Every database has deficiencies. In this respect, NSQIP is not spared, and the evidence would suggest that MI is underreported in this key database. The incidence of MI reported here is 1.3%; however, we would expect, in a cohort of this risk profile, the rate to be 3 to 4 times higher. As an example, the recently completed PeriOperative ISchemic Evaluation (POISE) 2 investigation found an incidence of acute postoperative MI over 6%.[19] The MI rate in POISE 2 occurred in a population with a mortality rate that was less than half of that seen in the present study. The underreporting

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phenomena are further demonstrated by the number of cardiac arrests that outnumber the MI by a more than a 2-to-1 ratio, a ratio we consider to be implausible. (The POISE 2 results show an opposite ratio; MIs outnumber arrests in a 30-to-1 ratio.) Many studies now show that postoperative MI is predominantly non–ST segment elevation MI and clinically silent (painless).[20,21] The NSQIP definition for MI is a new Q wave, which as many recent studies now show is a small minority of all perioperative cardiac events. Detection of increased cardiac biomarkers is central to the diagnosis of MI.[22] The clinical silence makes the diagnosis of MI exceedingly difficult, especially if the decision to order a cardiac biomarker is based on clinical signs. This problem would be further compounded in an HF population since postoperative dyspnea will often be attributed to worsening HF leading less aggressive biomarker measurements. Importantly, for this analysis, NSQIP does not mandate the routine measurement of either troponin or creatine kinase. This type of clinically based, and hence sporadic, cardiac biomarker measurement has been shown to underestimate MI by 3-fold.[23] Thus, we are of the opinion that the lack of association between MI and HF in the present study is likely due to both reporting and detection bias.

There are other important aspects of the NSQIP database analysis to be considered. The reported frequency of HF is 0.87%; as stated above, the prevalence of HF in unselected surgical populations ranges from 2.5% to 10%.[7–9] Thus, the NSQIP definition likely fails to capture a large proportion of patients with chronic HF. The definition used by NSQIP is "new or worsening" HF, and the definition itself suggests anything but a stable patient ready for elective surgery and suggests a high degree of unmeasured confounding. Furthermore, unlike MI, perioperative clinicians have no idea of the minimal acceptable recovery period after an episode of decompensated HF before proceeding to "elective" surgery.[24] The process of care involved in the treatment of new or worsening HF is complex and involves the careful titration of several medications[25] (angiotensin-converting enzyme inhibitors, β-blockers, diuretics) with associated continuous follow-up. The fact that surgery was undertaken within a 30-day window would suggest to us that either the patients were not stabilized or the procedures were not elective surgeries. Emergent surgery is in and of itself associated with a 4-fold increase in mortality.[26,27] Ethnicity was not considered, although HF is also more prevalent in African Americans than Caucasians.[28] African Americans have an incidence of early-onset HF that is 20 times that of Caucasian men. Importantly, the development of depressed LVEF occurring 10 to 15 years earlier in African American men was not considered in this analysis.[29]

Anemia is highly prevalent in HF populations (>35%) and is also associated with preexisting renal failure, both of which are well recognized to increase adverse outcomes in HF patients. A meta-analysis found that the presence of anemia in both preserved and decreased LV function HF doubled mortality.[30] It is not clear if either of these confounders was adequately accounted for in the analysis. Thus, we are unsure of the effects that any of these potential confounding factors have on the measured association.

HF is a major, and a potentially lethal, perioperative comorbidity, and as the surgical population ages, the number of patients with HF we encounter will only increase. The report by Maile et al.[15] draws attention to the urgent need for hospitals, and practitioners, to adopt systematic processes of care and conduct research to ameliorate this unacceptably high rate of postoperative complications for patients with HF. We think a first step would be to have a frank discussion of the real risks and potential for complications that includes a mortality rate of 10%, during elective surgery. Only this will constitute informed consent. Perioperative medicine should investigate similar care pathways as outlined by the American Heart Association that insure that medications are titrated to effect and once stabilized should be continued throughout the perioperative period.[24] In response to this postoperative complication rate, we would think that the early postoperative course should be conducted in high-acuity nursing environments, with requisite assessment of cardiac biomarkers (troponin and brain natriuretic peptide). Finally, do not be lulled into a false sense of security by the preoperative demonstration of preserved LV function. ■

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