Left Ventricular Function as a Predictor of Noncardiac Surgical Procedural Outcome

John S. Ikonomidis, MD, PhD

A new study published in the February 12, 2019, issue of JAMA documents the negative association of depressed left ventricular function and associated heart failure symptoms on outcomes with noncardiac surgical procedures. Risk stratification prior to the performance of surgery has become an important aspect of preoperative planning. Robust databases now exist to allow surgeons to calculate surgical risk of mortality and other complications for a wide variety of procedures adjusted for a myriad of comorbidities. In the cardiac surgical realm, an important predictor of adverse outcome is depressed left ventricular function, a factor that is so important it often dominates multivariable regression analyses predictive of mortality and other postoperative complications.

Poor left ventricular function has also long been known to be a predictor of adverse outcome in noncardiac surgery, but this knowledge alone is an incomplete assessment. More information is needed regarding the effects of varying degrees of ventricular dysfunction, the presence or absence of heart failure symptoms, different heart failure types (reduced ejection fraction heart failure and normal ejection fraction heart failure), and the influence of procedural complexity.

In this week’s issue of JAMA, Lerman and colleagues determined the postoperative mortality risk of symptomatic and asymptomatic patients with heart failure, with and without preserved ejection fraction, compared with patients without heart failure. The data set was assembled from 609,735 noncardiac surgical patient records in the Veterans Affairs Surgical Quality Improvement Project database from 2009 to 2017. Left ventricular ejection fraction estimates were taken from associated echocardiogram reports, heart failure was documented by frequency of hospital admissions with a heart failure diagnosis and the presence of heart failure symptoms, and 3 levels of surgical procedural complexity were defined using the VA Surgical Complexity Matrix. Three multivariable mixed-effects logistic regression models were generated, the first comparing the postoperative mortality risk of all patients with and without heart failure, the second classifying patients with heart failure by left ventricular ejection fraction stratified into 4 levels, and the third model classifying patients with heart failure by the presence of heart failure symptoms.

The results of the analysis revealed that, compared with patients without heart failure, patients with heart failure experienced higher risk of 90-day postoperative mortality (mortality risk: 5.49% vs 1.22%). Compared with patients without heart failure, symptomatic patients with heart failure experienced greater risk (odds ratio, 2.37), and asymptomatic patients with heart failure (odds ratio, 1.53) including those patients with preserved left ventricular systolic function (odds ratio, 1.46) also experienced elevated risk. The crude 90-day postoperative mortality for patients with heart failure increased from 4.6% for standard complexity operations to 10.3% for complex procedures, and the postoperative mortality was 0.7% to 6.2% among patients with and without heart failure, respectively. For patients without heart failure, crude 90-day postoperative mortality increased from 0.7% to 6.2% (standard to complex). Overall, the adjusted absolute risk difference between patients with and without heart failure was 1.29% (95% CI, 1.22%-1.37%) for standard procedures, 1.69% (95% CI, 1.48%-1.94%) for intermediate procedures, and 1.80% (95% CI, 0.08-3.60) for complex procedures.

This is a well-written and well-reported study. In contrast to previous studies, this analysis provides a more detailed description of the associations of increasing levels of systolic dysfunction and the presence or absence of heart failure symptoms with surgical outcomes than previously documented. As the authors point out, the data set reflects an inherent selection bias because all patients analyzed were deemed fit for surgery, and hence no inferences can be drawn regarding patients who were considered for but did not receive surgery. In addition, as this is a Veterans Affairs patient population, the data set only comprised 8.6% female patients. However, the absolute number of female patients (52,563, of which 1391 had heart failure) is considerable. Overall, the data reported here is highly valuable and comprehensive information that practitioners can use for preoperative planning and also in discussions with patients.

REFERENCE