body radiation. We are grateful for the opportunity to discuss these important issues with you and look forward to further advances in the postoperative surveillance and treatment of lung cancer.

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DOES THE SOCIETY OF THORACIC SURGEONS RISK SCORE ACCURATELY PREDICT OPERATIVE MORTALITY FOR PATIENTS WITH PULMONARY HYPERTENSION?

To the Editor:

We read with interest the article by Kennedy and colleagues,¹ "Does the Society of Thoracic Surgeons Risk Score Accurately Predict Operative Mortality for Patients With Pulmonary Hypertension?" We concur with Kennedy and colleagues¹ that the current Society of Thoracic Surgeons system² poorly models patients with elevated pulmonary arterial pressure (PAP) or associated right heart dysfunction. In our experience and that of others, patients undergoing cardiac surgery with PAP hypertension have worse outcomes than patients without PAP elevation. An important question is why is PAP hypertension an important prognostic marker? To complement the work by Kennedy and colleagues,¹ we would like to emphasize that although

elevated PAP is a good marker for increased morbidity and mortality, the potential underlying reason for worse outcomes in these patients is right heart dysfunction.

For better independent quantification of right heart function, we have begun implementing cardiac magnetic resonance imaging (cMRI) on a routine basis for patients deemed to be at increased risk for right heart dysfunction arising from elevated PAP. Use of cMRI allows accurate interpretation of right ventricular ejection fraction as well as chamber volumes or right ventricular end-diastolic and end-systolic volumes, which serve as the criterion standard for establishment of right heart function in patients with elevated PAP.³

We perform cMRI selectively during our preoperative workup in patients with suspected elevated PAP and in those deemed to be at risk for possible right heart dysfunction, such as patients with valvular heart disease and those with ischemic cardiomyopathy.⁴⁻⁶ Patients who are not found to have any associated right heart dysfunction are then reevaluated to establish whether there are interventions available for medical optimization, because increased PAP is often due to other reversible cardiac causes or noncardiogenic causes in this subset (sleep apnea, volume overload, interstitial lung disease, etc).⁴ Those who demonstrate severe right heart dysfunction are also reevaluated for medical optimization, as well as for appropriateness of surgical intervention, especially in patients with apparent advanced biventricular disease. Within our population, this method has allowed us to improve preoperative risk stratification and our ability to select appropriate surgical candidates, improving our outcomes.^{5,6}

We believe that cMRI should be used in patients with elevated PAP (mean PAP >35 mm Hg) to help define right ventricular function and better select patients for cardiac

surgical procedures. Consideration should be also given to adding right heart function to existing risk models to accurately risk stratify this population.

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Reply to the Editor:

We appreciate the comments by Trachiotis and colleagues on the importance of right ventricular (RV) function in perioperative morbidity and mortality. We agree that a comprehensive assessment of RV function

includes imaging data, such as cardiovascular magnetic resonance imaging (MRI) or echocardiography, and complete hemodynamic assessment and laboratory data. Cardiovascular MRI generally provides superior RV functional assessment compared with echocardiography. Unfortunately, not all patients being evaluated for cardiac surgery are candidates for cardiovascular MRI because of hemodynamic instability or the presence of incompatible devices, such as pacemakers or defibrillators, intra-aortic balloon pumps, and left ventricular assist devices. Echocardiography, either transthoracic or transesophageal, can be performed at the bedside or in the operating room, and therefore has the advantage of providing immediate feedback on the impact of various interventions, such as fluid administration, adjustment of ventilator parameters, pressor and inotrope adjustment, and weaning from cardiopulmonary bypass.

A thorough hemodynamic evaluation is required to interpret the significance of pulmonary artery pressures. As RV dysfunction progresses to outright RV failure, pulmonary pressures and cardiac output decrease, and right atrial pressure increases. This concept has been used widely to predict the risk of RV failure after left ventricular assist device placement with the RV stroke work index ([pulmonary artery mean – radial artery mean] · confidence interval/hazard ratio).¹ A simpler determination of the ratio of right atrial pressure to pulmonary capillary wedge pressure is insightful, with values greater than 0.63 indicating higher risk for RV failure.²

Finally, laboratory evaluation of hepatic and renal function provides another means of assessing RV function. Elevated aspartate aminotransferase, bilirubin, and blood urea nitrogen are predictive of RV failure after left ventricular assist device placement.^{2,3} Likewise, the Model for End-Stage Liver Disease, consisting of total bilirubin, international

normalized ratio, and creatinine, predicts mortality for tricuspid valve surgery.⁴

The final major point of our publication is that pulmonary hypertension in the setting of isolated coronary artery bypass grafting carries a higher risk compared with valvular heart disease, likely because pulmonary pressures rapidly improve with correction of valve lesions but not with revascularization.⁵

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THE IMPORTANCE OF THE POSTERIOR LEAFLET ANGLE IN CHRONIC ISCHEMIC MITRAL REGURGITATION

To the Editor:

I have read with great interest the article by Fino and colleagues.¹ Their conclusions are very interesting.

However, it would seem that the success rate achieved with the technique described originally by Bolling and colleagues² is unacceptable and the complication rate is unacceptably high. Restrictive mitral annuloplasty inserting a small ring, often 26 mm or 28 mm, is based on the principle of anterior advancement of the posterior mitral annulus. So, the tethered posterior leaflet (PL) meets the anterior leaflet in a more anterior displaced closure line. Consequently, the effective mitral valve area is reduced. Complete prosthetic annuloplasty rings to treat chronic ischemic mitral regurgitation are an absolute must because there is an anteroposterior annular enlargement³ in addition to the asymmetric PL tethering.⁴ It is therefore clear that, in restrictive mitral annuloplasty, the higher the PL angle, the greater the need for mitral valve closure line anterior displacement, and more likely the possibility of over reduction of the mitral valve area. We have addressed this issue in the study by Magne and colleagues.⁵ Restrictive mitral annuloplasty in chronic ischemic mitral regurgitation is most likely to fail in patients with a PL angle greater than 45 degrees by echocardiographic study. The best predictor of postoperative persistence of mitral regurgitation was a PL angle greater than 45 degrees. Since 2011, we have selected exclusively patients with a PL angle less than 45 degrees for restrictive mitral valve annuloplasty in chronic ischemic mitral regurgitation. This approach has drastically reduced the need to use very small rings. We had no need to use 26-mm rings. Usually, 28-mm or 30-mm complete rings achieve good mitral coaptation while solving the problem of over reduction. This fact may be due to a decreased need for anterior displacement of the mitral valve closure line when the PL angle is less than 45 degrees.