Commentary: The golden ratio

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Central Message

Serum uric acid level and lymphocyte count may independently predict operative outcomes in older patients with rheumatic heart disease undergoing valvular surgery.

See Article page 420.

Preoperative risk stratification of cardiothoracic patients has come to the forefront of the specialty as ever sicker patients are evaluated for complex cardiac procedures.^{1,2} Valvular surgery³ and advanced age⁴ pose particular clinical challenges. In this month's issue of the *Journal*, Wei and colleagues⁵ from Gangzhou, China, present the clinical outcomes of 949 patients older than 60 years who underwent valvular replacement for rheumatic heart disease. On the basis of earlier data,⁶ Wei and colleagues⁵ developed a ratio of preoperative uric acid level to lymphocyte count (ULR) as a predictor of postoperative mortality and morbidity. In this large patient cohort, Wei and colleagues⁵ found the ULR to be an independent predictor of patient survival, with an optimal cutoff value greater than 3.7 associated with mortality and adjusted odds ratios of 2.69 and 2.52 for in-hospital and 1-year mortalities, respectively. In-hospital death increased with each ULR tertile, but so did the complexity of surgical intervention, with the incidences of double and triple valve surgery substantially greater in the highest tertile. Although the extent of surgical intervention was not found to be a predictor of in-hospital mortality, pulmonary artery systolic pressure, a surrogate for advanced rheumatic valvular disease, was shown to be a significant prognosticator in both univariate and multivariate analyses. As both major adverse clinical event rate and 1-year mortality were largely driven by in-hospital death, this important influence of pulmonary hypertension on surgical outcomes should not be overlooked or minimized. Indeed, these same investigators⁷ found pulmonary artery pressure to be a strong predictor of in-hospital mortality in younger patients with rheumatic mitral valve disease.

Elevated uric acid levels have been associated with increased incidence of heart failure and adverse outcomes,⁸ potentially as a result of excessive oxidative stress⁹ and deleterious renal effects.¹⁰ Low lymphocyte count, a presumed marker of neurohormonal and cytokine activation and malnutrition, has been associated with increased mortality in patients with heart failure^{11,12} and those with severe chronic obstructive pulmonary disease.¹³ In its

simplest form, both the numerator and the denominator of the presented ratio are a reflection of heart failure but with direct and inverse relationships, respectively. It is therefore not surprising that the resultant index was a powerful predictor of mortality in patients with rheumatic valve disease yet not superior to uric acid alone presented in the authors' previous work.⁵ In essence the ULR is a sheep in wolf's clothing, potentiating the effect of a potent prognosticator of clinical outcomes, heart failure, on postoperative mortality of patients with cardiac valvular disease. Interestingly, New York Heart Association functional class, a subjective measure of clinical heart failure, was only slightly inferior in predicting outcomes, but ULR was significantly superior to preoperative N-terminal pro-B-type natriuretic peptide levels. Although Society of Thoracic Surgeons Score was not calculated for these patients, the euroSCORE was used by Wei and colleagues⁵ and found not inferior to the ULR. This brings up the question of whether the ULR represents another in the plethora of preoperative risk indices or a physiologic indicator with potential for risk mitigation. Is the index generalizable across all cardiac surgical patients or specific to the more inflammatory etiology of rheumatic heart disease? Whether alterations of lymphocyte count with improved nutrition or reduction of uric acid with pharmacologic therapy could improve outcomes remains to be demonstrated. These parameters are, however, a reflection of the complex world of heart failure hemodynamic, humoral, and

neuroendocrine milieu, elements that are not easily classified or affected. The formidable task of validating the ratio and demonstrating risk mitigation lies ahead of the authors. It is this process that will ultimately determine the ULR to be either a meaningful mathematical predictor or another pleasing ratio.

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