Severe Tricuspid Valve Regurgitation Is Not an Innocent Finding to Be Ignored!* 

Gösta B. Pettersson, MD, PhD, L. Leonardo Rodriguez, MD, Eugene H. Blackstone, MD

In this issue of *iJACC*, Topilsky et al. (1) at the Mayo Clinic present a provocative study on the clinical outcome of isolated tricuspid regurgitation (TR). These authors studied the late outcomes of patients with isolated TR collected in a program of TR quantification that enrolled patients with holosystolic TR from 1995 to 2005. In this study, isolated TR included patients with no other important valvular or other cardiac disease, but included patients with atrial fibrillation and elevated right ventricular (RV) systolic pressure to <50 mm Hg. All underwent a comprehensive echocardiographic study of cardiac morphology and function, including TR quantification using the proximal isovelocity surface area (PISA) method. After exclusion of patients with pulmonary hypertension, overt cause of TR, or a serious life-limiting illness, 142 patients with isolated functional TR were identified: 74 with mild to moderate TR and 68 with severe TR. To address the authors’ objective to study the effect of isolated (functional) TR on outcomes compared with those of patients having trivial TR, 1,972 patients with trivial TR were identified during the same period, and from this group, 211 were selected for the study by frequency (not propensity) matching to 5 variables: sex, age within 10 years, left ventricular (presumably) ejection fraction within 5%, year of diagnosis, and the presence or absence of atrial fibrillation. Selecting patients with trivial (rather than no) TR allowed collection of the same echocardiographic variables collected from patients with more severe TR, including estimation of RV systolic pressure as a surrogate for pulmonary artery pressure.

The results of this study show that of several measures collected from 1 clinical and 1 echocardiographic examination, TR quantification by regurgitant orifice area (PISA) was the most predictive of adverse outcomes. Although the visual qualitative estimation of TR severity was useful to identify the highest risk patients, it was less predictive of outcomes. Some aspects of the evaluation are noteworthy. Several modifications of the PISA method were made that are not routinely used in daily clinical practice (2) and not included in American Society of Echocardiography guidelines (3). RV function was evaluated qualitatively and by indexes of myocardial performance (right ventricular index of myocardial performance or myocardial performance index), but the investigators did not re-review the echocardiograms to measure “more recent methods” of RV assessment, such as tricuspid annular plane systolic excursion, lateral annular systolic velocity, and strain and strain rate.

After the index echocardiographic examination, the primary authors appear not to have been further involved in managing the patients; rather, patients returned to and were treated by other physicians. Indications for this referral are not provided, and we therefore presume that these patients had a clinical indication for their referral to undergo echocardiography. We do not know how many were symptomatic, only that symptoms were more frequent in those with more than trivial TR. Atrial fibrillation was present in 45% of patients with trivial TR and 44% of those with mild to severe TR.

Outcomes were assessed by review of medical records, follow-up surveys, and telephone interviews. Endpoints were all-cause mortality and cardiovascular events (cardiac deaths, including sudden death.*
and death caused by congestive heart failure). Outcomes were analyzed from echocardiographic diagnosis until death, cardiac surgery, or last follow-up up to 2010. We must presume the follow-up was 100% complete unless inability to determine outcome was another exclusion criterion.

This is a timely paper, further fueling the debate surrounding the clinical importance of TR and RV dysfunction and an increasingly aggressive approach to severe TR. Some even suggest tricuspid annuloplasty based only on the diameter of the tricuspid annulus in patients undergoing surgery for left-sided heart disease with the potential for developing functional TR (4). In our studies of functional TR secondary to degenerative mitral valve disease, TR went hand in hand with RV dysfunction, which was prognostically more important than TR (5,6).

In our practice, symptomatic patients with severe TR, with or without atrial fibrillation, undergo a series of studies, including special echocardiographic measures of RV function, magnetic resonance imaging, and right and left heart catheterization, all of which are clinically integrated. Patients are considered for tricuspid valve surgery if RV function is deemed good enough for the heart to take advantage of a competent tricuspid valve. We would carefully look for and consider any possible cause of TR, be it functional with a possible forward cause of TR (left-sided heart disease with pulmonary venous hypertension, pulmonary disease with increased pulmonary vascular resistance, pulmonary valve disease, or intrinsic RV disease), intrinsic structural tricuspid valve disease, or functional tricuspid valve disease with a possible cause from the right atrial side (atrial fibrillation or left-to-right shunts [atrial septal defect]). Any such cause would be weighed and in principle strengthen the indication for surgery. Because atrial fibrillation is a possible cause of TR, we would not categorize TR as isolated in such a patient. After this diagnostic workup, our group of patients with isolated functional TR would be very small! However, whether the authors are right in their use of the “concept of functional isolated TR” or they are just studying patients with “isolated TR” is unimportant. The study does not claim to add to our mechanistic understanding of isolated TR. Rather, the fact that 1 clinical assessment and 1 echocardiogram are this prognostically predictive makes this paper powerful.

That only 12 of 68 patients (18%) with severe TR underwent surgery becomes disturbing in light of <40% 10-year survival and suggests that a more aggressive approach is justified. Presentation of a competing risks curve for death and surgery would be helpful. It would also be instructive to know how congestive heart failure was handled: Were patients censored after 1 episode? More careful follow-up studies are needed to provide more data points for clinical symptomatology, TR development, tricuspid valve tethering, RV morphology, function, and hemodynamics, and studies of effectiveness and durability of tricuspid valve surgery with regard to these echocardiographic variables to finalize our conclusion that isolated severe TR is a surgical disease and to recommend revising surgical guidelines. Today, the American Heart Association/American College of Cardiology guidelines deem primary TR unresponsive to medical therapy as a class IIa recommendation for surgery (7). We have provided data about the efficacy of tricuspid valve repair for functional TR in patients with degenerative mitral valve disease; in these patients, tricuspid valve repair seems to effectively and durably eliminate TR and improve RV function, whereas mitral valve surgery alone accomplishes only a temporary improvement (8).

To us, the right side of the heart is humbling. It is less well studied and understood than the left. This includes the interaction between RV morphology and function and TR, right/left ventricular interaction, clinical importance of TR, indications for surgery, surgical techniques for tricuspid valve repair, and postoperative management. The search for new ways to repair valves with functional TR is an indication of the limitations of our present techniques and our understanding of the tricuspid valve. The authors represent the echocardiography laboratory with the greatest confidence in the PISA technique and should be congratulated on this powerful study. The next and important step will be to gain further insight into the roles of RV function and hemodynamics in informing our management of patients with TR.

**REFERENCES**


KEY WORDS effective regurgitant orifice, isolated tricuspid regurgitation, prognosis, tricuspid regurgitation