

EDITORIAL COMMENT

Should Less-Than-Severe Functional Tricuspid Regurgitation in Patients Undergoing Left-Sided Surgery Be Treated More Aggressively?*



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Right ventricular (RV) dilation and/or dysfunction ensuing from valvular or myopathic derangements of the left heart can lead to asymmetric dilation or distortion of the nonplanar tricuspid valve (TV) annulus, leaflet tethering, malcoaptation, and functional tricuspid regurgitation (FTR).¹ The accompanying volume overload in turn, causes further RV dilation and worsening TR, initiating a vicious spiral that may lead to intractable right heart failure and death, left unchecked.

The incidence of FTR in patients undergoing left heart surgery ranges between 7.5% to 14.0% for severe FTR and 15% to 30% for moderate FTR.² Of note, FTR present at the time of left-sided valve surgery has been estimated to progress in 7.7% to 67% of patients.² Residual or uncorrected FTR, following left-sided surgery, can lead to decreased functional capacity, peripheral edema, congestive hepatopathy, ascites, right heart failure and is predictive of poor survival. In this context, it is important to note that reoperations for isolated or recurrent FTR are associated with very high perioperative mortality.^{3,4}

*Editorials published in *JACC: Advances* reflect the views of the authors and do not necessarily represent the views of *JACC: Advances* or the American College of Cardiology.

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The North American and European guidelines,^{5,6} both recommend concomitant TV surgery in patients with severe TR undergoing left-sided valve surgery, irrespective of the presence of symptoms, (Class 1). In contrast, surgery is deemed reasonable and should be considered in patients with mild or moderate (progressive) TR with a dilated annulus (≥ 40 mm or >21 mm/m²) or those with prior heart failure (Class 2a). Because the latter recommendations are based on observational data, the most effective strategy remains somewhat controversial, and consequently, concomitant TV repair practice patterns for less-than-severe FTR vary widely.⁷ To some extent, previous guideline discrepancies, the concerns of increased cardiopulmonary bypass time, the need for permanent pacemaker implantation, and the historical incremental mortality associated with TV repairs have influenced a more conservative approach to TV repair, especially in patients with less-than-severe grades of TR, undergoing left heart surgery.

Nonetheless, a growing, more robust, contemporary body of evidence suggests that concomitant TV repair at the time of left-sided surgery in patients with moderate or less-than-moderate FTR improves long-term right-sided remodeling, reduces TR severity, and prevents postoperative TR progression at long-term follow up, without increasing perioperative mortality.⁷⁻¹¹ In a large meta-analysis by Pagnesi et al⁹ of patients with mild or moderate FTR, a concomitant TV repair strategy at the time of aortic or mitral surgery was associated with a numerically lower but nonsignificant reduction in all-cause mortality, a significant reduction in cardiac mortality, and lower rates of more than moderate TR and less TR progression at 5 years.

Another important consideration is whether the grade of FTR or the presence of tricuspid annular dilation be the overarching criterion for pursuing preemptive surgical repair. This question stems from potential inconsistencies in the echocardiographic grading of TR (particularly moderate FTR) that may be influenced by dynamic variations in preload, afterload, and RV function, compared to a relatively more objective and reproducible assessment of tricuspid annular size. Notably, tricuspid annular dilation observed in patients with mild or no preoperative TR at the time of left-sided surgery may not reverse remodel and, in some instances, continue to progressively dilate, when left untreated. Based on these observations, Dreyfus and colleagues proposed preemptive TV repair in patients with annular dilation (≥ 70 mm intercommissural distance measured intraoperatively in a flaccid heart, equivalent to a 40 mm preoperative diameter) even in the absence of significant preoperative FTR,¹ a risk factor endorsed in current societal guidelines.

In this issue of *JACC: Advances*, the study by Tan et al¹² extends existing literature on the detrimental effect of moderate FTR on postoperative outcomes and mortality. This retrospective study analyzed a large cohort of patients, including those undergoing mitral, aortic, and coronary artery bypass surgery surgeries and observed moderate TR to be independently associated with a 2- to 3-fold increase in major morbidity and mortality during the index-hospitalization and mid-term, all-cause mortality at follow-up. A novel and intriguing observation was the interaction between moderate TR and pulmonary artery systolic pressure, in that ‘normal’ pulmonary artery pressure predicted a higher risk of mortality. A similar, albeit not statistically significant trend was observed in those with RV dysfunction. The authors should be congratulated for this interesting, externally validated analysis that adds to our understanding of the prognostic impact of moderate TR. The explanation for these findings, however, remains elusive, as no baseline TV annular measurements, invasive pulmonary vascular resistance, or postoperative echo data were available for further scrutiny. Nonetheless, postoperative distortions of tricuspid annular geometry (related to loss of pericardial restraint, postcardiotomy changes, implantation of ring/valve prosthesis) coupled with postoperative RV dysfunction could be at play. Based on the negligible differences in baseline RV function, reported by Tan et al in their cohorts of moderate TR, it is possible that patients with pre-existing pulmonary hypertension were better conditioned to adapt

to potential annular distortions and functional derangements described above than their counterparts with normal pulmonary artery pressure. Other plausible explanations include the presence of a pre-existing myopathic right ventricle (poor contractile reserve) that could conceivably decline further postoperatively, resulting in RV failure.

In terms of contemporary surgical repair strategies for FTR, high-quality repair is best achieved with a rigid or semirigid annuloplasty ring and preferred over suture-based techniques or replacements. Meanwhile, technological developments in transcatheter TV therapies (particularly edge-edge repair devices) appear to be making rapid strides. Numerous clinical trials to date have reported promising results, both in terms of safety and effectiveness, potentially offering minimally invasive options for remediation of residual or recurrent FTR, in the near future.¹³

Future research needs to center around a comprehensive preoperative assessment of RV size and systolic function to better identify patients at high risk. Similarly, studies exploring preoperative and postoperative tricuspid annular geometry using 3-dimensional-echocardiographic techniques would provide invaluable mechanistic insights.

In aggregate, results of the above studies, based on retrospective and observational data seem to support concomitant surgical repair of moderate TR, given improvements in perioperative outcomes, salutary effects on RV function, and the positive impact on survival. However, large, prospective, randomized control trial data are needed to further refine indications for surgical repair for less-than-severe FTR in patients undergoing left-sided valve surgery. To this end, results of an ongoing randomized controlled trial “Evaluating the Benefit of Concurrent Tricuspid Valve Repair During Mitral Surgery” (NCT02675244), will explore whether TV repair for mild to moderate FTR impacts mortality, reoperation for TR, TR progression, and assess the presence of severe TR at 2 years; with completion expected in 2024, results should provide much needed clarity on this controversial issue.

FUNDING SUPPORT AND AUTHOR DISCLOSURES

The authors have reported that they have no relationships relevant to the contents of this paper to disclose.

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KEY WORDS mitral surgery, secondary tricuspid regurgitation, tricuspid surgical repair