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## Commentary: The tricuspid valve: No longer forgotten but still unknown

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The association between the degree of functional tricuspid regurgitation (TR) and poor outcome is well established, and the severity of the regurgitation may be a marker of worsening right ventricular dysfunction that is not fully appreciated by imaging. Traditionally, the approach to surgical repair for functional TR has primarily consisted of a downsized annuloplasty ring. However, annuloplasty alone has been associated with an important incidence of recurrence.<sup>1</sup> The mechanism of functional TR is complex and is a combination of many factors, including annular dilatation and geometric ventricular distortion with tethering of the papillary muscles and leaflet restriction.<sup>2</sup> Given these complexities, an effective and durable repair solution has yet to emerge.

In this issue of the *Journal*, Takeshita and colleagues<sup>3</sup> present an intriguing technique to repair severe functional TR. In their single-patient case report, rather than simply replacing the valve, the authors describe several maneuvers, coined “papillary muscle relocation,” which foreshortens the distance of the anterior papillary muscle to the annulus, and “annular repositioning,” which alters the position of the septal annulus toward the ventricular septum. In theory, these maneuvers relieve the tethering forces on the chordae and improve anterior and septal leaflet motion while resolving restriction and ultimately improving coaptation depth. Their case report details the maneuvers and the excellent results at 3 years of follow-up, with only mild TR and no stenosis.

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### CENTRAL MESSAGE

Severe functional TR is complex, annuloplasty may be inadequate, and adjunctive techniques may improve results. Sufficient evidence is needed to determine which maneuvers are effective and durable.

Unlike degenerative valve disease, part of the challenge in functional valve repair is that the underlying ventricular pathology is the etiology of the valve dysfunction, and often this is difficult to address. This has long been evident in the challenge of repairing secondary mitral regurgitation, and various papillary muscle–modification techniques have largely fallen out of favor due to lack of reproducibility. Takeshita and colleagues advocate this repair technique for the most severe form of TR. Indeed, the patient presented is quite challenging, with double-valve disease, significant biventricular dysfunction, coronary disease, as well as systemic manifestations of advanced right heart failure with edema and ascites. Not surprisingly, the evaluation and repair is complex. Preoperative tethering height needs to be accurately measured to determine which patients would benefit, and appropriate length of repair is essential to avoid further restriction or prolapse. Annular downsizing is still an important component, and we also see the authors’ use of an Alfieri-type suture. What about less than the most severe form of functional TR with similar ventricular findings? Is this only for one type of functional TR? Such nuances and complexities beget the question of adoption and reproducibility, as we have seen with functional mitral regurgitation. Is this eloquent repair more beneficial than replacement, especially considering emerging transcatheter valve-in-valve procedures? While early results in a single patient appear intriguing, a larger series is needed with

long-term follow-up to determine efficacy before victory can be declared. Reoperation for recurrent TR carries one of the greatest risks of operative mortality.

The authors should be commended for an innovative approach for tackling functional TR in such an ill patient. The important work advanced here continues to add to our understanding of functional TR but also highlights the challenges and many facets of repairing the tricuspid valve and how unknown it is.

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