complex nature of the tricuspid valve, subvalvular apparatus and RV. Even by the authors' own admission, however, this experimental model presents a simplified version of FTR pathology. An ex vivo model is not meant to serve as an in vivo surrogate, but rather functions to remove external variables to isolate the area of interest. The true value in this study, then, is in its validation of previous in vivo analyses suggesting a need to correct subvalvular pathology along with the valve itself.^{7,8}

Ultimately, the true nature of severe FTR is one that necessitates careful consideration not only of the status of the right heart but the entire cardiovascular system and overall patient health. Indeed, while ideal surgical management of FTR may very well involve addressing both the valve and subvalvular apparatus, the Hippocratic dictum of *primum non nocere* may prevail and instead warrant a safe, if not optimal, valve-only approach. Overall, Amedi and colleagues are to be commended for their experimental ingenuity as well as their meaningful contribution to the understanding of the tricuspid valve and associated repair techniques. Through their findings, further proof is given to the assertion that addressing

subvalvular pathology is necessary in finding a true gold standard repair for FTR.

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Commentary: One ring to rule them all?

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J. R. R. Tolkien's *Lord of the Rings* trilogy has as its centerpiece the character of Gollum and his obsession with the One Ring to Rule Them All. The tale, which is epic and has spawned numerous literary and philosophical debates,

Asvin M. Ganapathi, MD (left), and Nahush A. Mokadam, MD, FACS, FACC (right)

CENTRAL MESSAGE

Tricuspid valve ring annuloplasty might not be the best intervention for functional tricuspid valve regurgitation. Understanding mechanisms of failure may lead to more durable repairs.

centers on the single ring that is all-powerful and designed to help Sauron gain control of Middle Earth. While there are numerous memorable characters and plots, Gollum calling

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the ring “my precious” is one of the most iconic aspects of the books and movies.

In this issue of the *Journal*, Amedi and colleagues¹ describe their examination of 2 surgical techniques for tricuspid valve repair: tricuspid valve ring annuloplasty and Hetzer focal suture annuloplasty. They compare the 2 repair techniques using an ex vivo porcine heart functional model of tricuspid valve regurgitation (TR). Although both annuloplasty methods reduced functional TR, neither completely eliminated the TR, and the residual regurgitation was secondary to persistent leaflet tethering and decreased mobility.¹ Although the data are not from in vivo human measurements, they provide valuable information about 2 current tricuspid repair techniques and more importantly helps to explain the potential failure mechanisms of these repairs. These data may also help to explain the reported rates of recurrence of significant TR in 6% to 31% of patients following tricuspid ring annuloplasty.²

Given that functional TR accounts for nearly 90% of all cases of TR,³ an understanding of the optimum method of repair is essential. Current guidelines for tricuspid valve repair are somewhat vague, with the only class 1 recommendation being for severe TR.⁴ However, there is evidence demonstrating a lack of improvement of functional TR when left alone, and persistent significant TR is known to be associated with decreased quality of life and survival.⁵

Given the lack of clear direction, some believe that addressing the primary pathology (ie, mitral or aortic insufficiency) will lead to resolution of significant TR. Furthermore, the primary method of repair is ring annuloplasty alone given its ease of performance, with some advocating for use of a certain ring size for almost

all patients.⁶ This approach is quite different from the treatment of mitral valve regurgitation, for which there are numerous accepted options, although the most frequently used approaches are combinations of various techniques, such as chordal replacement or leaflet resection, with ring annuloplasty. Thus, models such as that described by Amedi and colleagues will help us understand why a particular method of repair may fail and potentially lead to more durable repair techniques.

As we continue to grapple with functional TR, a better understanding of the impact of our repairs will be crucial to advances in therapy, and it will be beneficial to consider methods beyond simple ring annuloplasty. We do not live in Middle Earth, and despite our desire to follow Gollum's lead, in tricuspid valve repair, we need to stop searching for the One Ring to Rule Us All.

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