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EDITORIAL COMMENT

Transcatheter Treatment Options for Severe Tricuspid Regurgitation

And the Winner Is Valve Replacement?*

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Although severe tricuspid regurgitation (TR) is an independent predictor of survival (1), even if moderate and in all clinical contexts (2–4), the statement by Dr. Braunwald (5) in 1967 on the primacy of conservative management of functional TR may still hold true in light of the staggering undertreatment of this valve lesion (6). Surgical treatment of functional TR, if performed early based on pure annular dilation, has been shown to be safe, effective, and recommended by both U.S. and European guidelines (7–9), but remains poorly adopted in clinical practice of patients undergoing surgery for mitral regurgitation with concomitant TR (4). Of note, surgery for TR performed late after previous left-sided surgery is associated with important excess mortality (10) and frequent recurrence of TR during follow-up (11).

It is against this background that the study by Fam et al. (12) in this issue of *JACC: Cardiovascular Interventions* fills a crucial therapeutic gap by successfully eliminating TR in the absence of 30-day mortality among symptomatic patients at high estimated operative risk. It also overcomes the limitation of residual TR after transcatheter edge-to-edge interventions. Indeed, the present paper reporting the first in-man experience of the EVOQUE transcatheter tricuspid valve replacement (TTVR) device (Edwards Lifesciences, Irvine, California) is mainly limited by its observational design. It offers an attractive therapeutic option to overcome current undertreatment by addressing TR correction after left-sided valve surgery in patients previously deemed inoperable by the heart team owing to excessive risk. Indeed, patients with severe functional TR are often symptomatic and diagnosed late during the disease course, with associated comorbidities such as right ventricular, renal, or liver dysfunction, rendering surgery an unrealistic option.

Although functional TR as a result of left-sided valvular disease is most frequent (6), it is followed in terms of frequency by pacemaker-induced TR, which is frequently related to leaflet impingement (13). Moreover, significant functional TR in the context of mitral regurgitation (4) is related to multifactorial determinants including atrial fibrillation or sex. Because the efficacy of diuretic agents and nitrates in the medical treatment of TR is limited, alternative therapeutic approaches need to be considered.

As the decision-making is complex, it requires the expertise of dedicated valvular heart teams in tertiary centers of excellence (14). Such units will provide optimal expertise with interventional cardiologists, imaging cardiologists, cardiac surgeons, and intensivists. If the patient has no or little comorbidities and is relatively young enough, surgery may remain a viable option, which is, however, rare; if the patient has comorbidities, advanced age, and impaired renal or liver function, then transcatheter treatment options are often the better therapeutic consideration. It seems fair to acknowledge that transcatheter therapy has already changed the scope of such frail patients.

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The use of MitraClip, TriClip (both Abbott Vascular, Santa Clara, California), or Pascal (Edwards Lifesciences, Irvine, California) transcatheter edge-to-edge repair devices have allowed some significant relief in TR severity and improvements of symptoms. However, there are some remaining pitfalls that may be addressed by TTVR. Indeed, only 57% of the patients in the TRILUMINATE study (Trial to Evaluate Treatment With Abbott Transcatheter Clip Repair System in Patients With Moderate or Greater Tricuspid Regurgitation) were found to have TR <2+ at 30 days by the echo core lab assessment (15), as opposed to 96% using TTVR EVOQUE.

Within a short period of time, a sufficient number of cases exploring the transcatheter edge-to-edge concept have been performed, allowing a more precise definition of the limits and contraindications of this technique. Among these limiting factors are massive or torrential TR at baseline (16), leaflet tethering >7 to 10 mm, and large coaptation gaps >10 mm. Additionally, severe annular dilatation observed in this cohort (45 ± 7 mm) is noteworthy, because treatment of such TR etiology is difficult to address by clipping the leaflets alone. Obviously for many such patients, conventional surgery is not an option: first, given the cohort STS score of 9 ± 2%, and second, given the difficulty to appraise accurately right ventricular heart failure. Right ventricular failure was present in all patients of the present study at baseline with a mean right ventricular ejection fraction of 49 ± 3% and tricuspid annular plane systolic excursion of 16 ± 3%. Even if these parameters may vary according to preload and afterload conditions, the most important surgical risk factors are decreased liver and kidney function. Moreover, TR surgery promotes initially an inflammatory reaction, which even if short, has a transient negative impact on a failing right ventricle. This is the main reason why surgery and transcatheter therapies without cardiopulmonary bypass cannot compete in this subset of patients.

The present study therefore offers important therapeutic aspects, particularly among high and extreme surgical risk patients. Indeed, the absence of any 30-day mortality and a TR grade <1+ in 88% of patients in this study is truly remarkable.

Could it be extrapolated that transcatheter edge-to-edge repair will see its indication decrease in favor of TTVR in the future? It might be too early for such assertive conclusions, but the future might favor transcatheter replacement rather than repair. Of note, transcatheter replacement has a major advantage, given the size of the annulus, allowing for valve-in-valve procedures if the initial bioprosthesis should fail. The circle seems complete: surgery began with replacements followed by repairs, whereas transcatheter therapy has begun by repairs and might end up by replacements. Future clinical trials should evaluate transcatheter tricuspid-valve repair versus replacement, aiming at improving the outcome of patients with TR.

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