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Transcatheter interventions for mitral regurgitation among patients with left ventricular dysfunction: repair or replacement?

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Mitral regurgitation (MR) is the most prevalent valvular heart disease in the Western world[1,2]. The prevalence of MR is expected to increase owing to the continuously ageing population and the increase in the prevalence of heart failure[1,2]. Percutaneous therapies have played a progressively larger role in the treatment of MR[3]. Transcatheter edge-to-edge repair (TEER) with the MitraClip system (Abbott) received U.S. Food and Drug Administration (FDA) approval in 2013 for the treatment of patients with symptomatic severe primary MR with prohibitive surgical risk and in 2019, for the treatment of patients with moderate-to-severe or severe secondary MR with persistent heart failure symptoms despite receiving optimal treatment. More recently, the PASCAL TEER system (Edwards Lifesciences) was approved for prohibitive surgical risk patients with primary MR. Nevertheless, TEER has certain limitations. Complete resolution, as well as the prevention of progression of MR, is not always possible with this approach, and residual MR ≥2+ is not uncommon[4]. Furthermore, certain anatomical features might preclude achieving successful results after TEER, including calcified leaflets, smaller valve areas, and short posterior leaflets[5]. As such, there is an existing need for further advances in transcatheter technology to achieve optimal and durable results across a broader spectrum of mitral valve (MV) anatomies.

Transcatheter MV replacement (TMVR) using dedicated transcatheter mitral prostheses has emerged as a viable option for the treatment of severe MR among high-risk patients with complex native MV anatomy[6]. Among different transcatheter heart valve (THV) platforms for the mitral valve, the greatest experience has been with transapical TMVR using the Tendyne device (Abbott), which has been performed in more than 800 patients worldwide[7]. The expanded feasibility study (EFS) of the Tendyne mitral valve system was a non-randomised, prospective study of transapical TMVR using Tendyne valves[8]. Recently, 2-year data from the first 100 patients enrolled in the Tendyne EFS were reported and showed favourable efficacy for TMVR in reducing MR severity (100% ≤1+ MR) and heart failure (HF)-related rehospitalisation (HFH), while all-cause mortality was 39%, which was highest in the first 3 months post-procedure[8]. The promising efficacy with TMVR has expanded the toolbox for the treatment of severe MR, but identification of ideal candidates for either technology, TEER or TMVR, remains to be determined. To date, limited data also exist regarding the comparative safety and effectiveness of TEER and TMVR for severe MR.

In this context, the study by Hungerford et al, presented in the current issue of AsiaIntervention, provides important information[7]. They report the results of their observational multicentre analysis comparing outcomes of transapical TMVR with the Tendyne THV (n=46) versus TEER using the MitraClip (n=50) among patients with severe MR. Patients allocated to TMVR had a prohibitive surgical risk and were evaluated by the local multidisciplinary Heart Team and deemed inappropriate for TEER due to complex MV anatomy. The study included patients with ≥3+ MR (primary/mixed or secondary/functional) and symptomatic left ventricular (LV) dysfunction (LV ejection fraction [LVEF] <50%). The primary endpoint was the composite of all-cause mortality or HFH at 30-day and 1-year assessment. Technical and procedural success were reported according to the Mitral Valve Academic Research Consortium (MVARC) criteria. The mechanism of MR was secondary in 70% vs 91% and primary/mixed in 30% vs 9% of the TEER and TMVR groups, respectively. Patients in the TEER group were ~8 years older, but with a numerically lower Society of Thoracic Surgeons (STS) score (7±6 vs 11±8). Preprocedural echocardiographic and clinical features were comparable in both groups. Technical success was achieved in 96% and 100% in the TEER and TMVR groups, respectively. There were no differences in device-specific complications between the two groups. At hospital discharge, ≤1+ MR and ≤2+MR were achieved in 96% vs 100% and 76% vs 100% of the TEER vs TMVR groups, respectively. Left ventricular volumes were unchanged post-TEER but

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were significantly reduced post-TMVR. The primary endpoint (all-cause mortality/HFH) was similar at 30 days (2.2% vs 4.0%) but significantly lower in the TEER versus the TMVR group at 1-year assessment (10.0% vs 32.6%). The TEER group also had lower 1-year HFH. Analysis limited to patients with secondary MR showed similar results to that of main study cohort.

Article, see page 78

The authors are to be congratulated for conducting their analysis on a topic of high clinical relevance. This is one of the first reports to date comparing outcomes of TEER versus TMVR among patients with severe MR and LV dysfunction. Patients with severe MR who have advanced heart failure and severe LV dysfunction are commonly deemed inappropriate for surgical treatment. Also, LV dysfunction is an independent predictor of poor outcomes among patients with severe MR referred for TEER using MitraClip[8,9]. The results of the current analysis provide reassuring data regarding the comparable efficacy and short-term safety for both MitraClip TEER and Tendyne TMVR in patients with LV dysfunction. Such findings were further reproduced in the analyses limited to patients with secondary MR. An important finding of the study was that patients undergoing TMVR had more complete and durable elimination of MR, as well as better reduction in LV volumes, compared with TEER patients. Nevertheless, these findings did not translate to an improvement in clinical endpoints among patients with TMVR, who in fact had higher rates of all-cause mortality or HFH at 1 year compared with patients undergoing TEER.

This study should be interpreted in the context of certain limitations. First, non-randomised comparisons between TEER and TMVR are inherently prone to significant selection bias and unmeasured confounders. The two treatment modalities in the current study were offered to patients with different risk profiles; TMVR was only offered to patients with prohibitive surgical risk, which was not a mandatory criterion in the TEER group. Furthermore, patients in the TMVR group were sicker and likely frailer, with complex MV anatomies unamenable for TEER. They had predominantly secondary MR and had a higher prevalence of coronary artery disease compared with the TEER group. Importantly, the exact details regarding the team decision for patient allocation to either TEER or TMVR were lacking in the current study. As stated by the authors, the small sample size and event rates precluded further adjustment of the statistical analyses to reduce the selection bias. Second, the study only evaluated patients undergoing TMVR using transapical access, which has been regarded as a more invasive access route, with a relatively longer length of stay and higher complication rates compared with transseptal access[6,10]. Echocardiographic outcomes were not core-lab adjudicated and were thus potentially prone to bias as well. Finally, the device implantations were variably performed at the clinical sites in the current study, such that TMVR was performed at all 3 sites, while TEER was performed at only 1 site. Hence, it is plausible that the results in both groups might have been affected by the respective site-related outcomes.

Collectively, the analysis by Hungerford et al solidifies the potential role of TMVR as a viable tool in the armamentarium of MV transcatheter therapies. TMVR could potentially offer a more complete and durable elimination of MR for a wider spectrum of MV anatomies. However, current TMVR technologies appear to be more invasive and have higher rates of complications compared with TEER. The ongoing SUMMIT Trial (Clinical Trial to Evaluate the Safety and Effectiveness of Using the Tendyne Mitral Valve System for the Treatment of Symptomatic Mitral Regurgitation; ClinicalTrials.gov: NCT03433274) will provide further insight on the long-term clinical outcomes of TEER versus TMVR among patients with severe MR. Additionally, other ongoing studies on several transseptal transcatheter mitral valve proth-eses will help to identify patients who can be optimally treated by TMVR. Until further head-to-head data are available, TEER and TMVR appear to provide a complementary role for Heart Teams when deciding on treatment options for patients with severe MR.

Conflict of interest statement

The authors have no conflicts of interest to declare.

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