



Comparison of Clinical and Echocardiographic Outcomes After Surgical Redo Mitral Valve Replacement and Transcatheter Mitral Valve-in-Valve Therapy

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ABSTRACT

OBJECTIVES There are minimal data regarding clinical outcomes and echocardiographic findings after transcatheter mitral valve-in-valve replacement (TMVR) compared with redo surgical mitral valve replacement (SMVR).

BACKGROUND TMVR therapy has emerged as therapy for a degenerated bioprosthetic valve failure.

METHODS The authors retrospectively identified patients with degenerated mitral bioprostheses who underwent redo SMVR or TMVR at 3 U.S. institutions. The authors compared clinical and echocardiographic outcomes of patients who had TMVR with those of patients who underwent redo SMVR.

RESULTS Sixty-two patients underwent TMVR and 59 patients underwent SMVR during the study period. Mean age and the Society of Thoracic Surgeons Predicted Risk of Mortality (STS PROM) scores were significantly higher in patients with TMVR than in those with SMVR (age 74.9 ± 9.4 years vs. 63.7 ± 14.9 years; $p < 0.001$; STS PROM $12.7 \pm 8.0\%$ vs. $8.7 \pm 10.1\%$; $p < 0.0001$). Total procedure time, intensive care unit hours, and post-procedure length of stay were all significantly shorter in the TMVR group. There was no difference in mortality at 1 year between the 2 groups (TMVR 11.3% vs. SMVR 11.9%; $p = 0.92$). Mean mitral valve pressure gradient and the grade of mitral regurgitation (MR) were similar between the TMVR group and the SMVR group (mitral valve pressure gradient 7.1 ± 2.5 mm Hg vs. 6.5 ± 2.5 mm Hg; $p = 0.42$; MR [\geq moderate] 3.8% vs. 5.6%; $p = 1.00$) at 30 days. At 1 year, the mitral valve pressure gradient was higher in the TMVR group (TMVR 7.2 ± 2.7 vs. SMVR 5.5 ± 1.8 ; $p = 0.01$), although there was no difference in the grade of MR.

CONCLUSIONS Despite the higher STS PROM in TMVR patients, there was no difference in 1-year mortality between the TMVR and SMVR groups. Echocardiographic findings after TMVR were similar to SMVR at 30 days. There was a statistically significant difference in mitral gradient at 1 year, though this is likely not clinically important. TMVR may be an alternative to SMVR in patients with previous mitral bioprosthetic valves. (J Am Coll Cardiol Intv 2018;11:1131-8)

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**ABBREVIATIONS
AND ACRONYMS**

- LVOT** = left ventricular outflow tract
- MDCT** = multidetector computed tomography
- MR** = mitral regurgitation
- MVARC** = Mitral Valve Academic Research Consortium
- SMVR** = surgical mitral valve replacement
- STS** = Society of Thoracic Surgeons
- TMVR** = transcatheter mitral valve-in-valve replacement

There are minimal data regarding clinical outcomes and echocardiographic findings after either transcatheter mitral valve-in-valve replacement (TMVR) or redo surgical mitral valve replacement (SMVR) for bioprosthetic valve failure. We investigated whether TMVR can achieve similar 30-day and 1-year outcomes compared with redo SMVR for bioprosthetic valve failure. Our report includes mortality and echocardiographic findings for TMVR and SMVR patients at discharge, 30 days, and 1 year.

METHODS

We retrospectively identified patients who underwent redo SMVR or TMVR for previous mitral bioprosthetic valve failure at Emory Healthcare (Atlanta, Georgia), Henry Ford Health System (Detroit, Michigan), and Saint Thomas Health (Nashville, Tennessee) from January 2007 to August 2017. The TMVR procedure was not done until 2012. All TMVR patients after that date were included (Figure 1). All patients had severely degenerated mitral bioprostheses. Each interventional approach was determined by a multidisciplinary heart team according to patient risk and anatomical findings. We excluded patients who had active endocarditis, required concomitant procedures for coronary artery disease or aortic disease, or underwent additional valve replacement.

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Echocardiographic parameters were reported according to the guidelines of the American Society of Echocardiography definition and the Mitral Valve

Academic Research Consortium (MVARC) consensus document (1-3). We also compared the 30-day and 1-year mortality between TMVR and SMVR patients.

Baseline characteristics, outcomes, and complications were reported according to the Society of Thoracic Surgeons (STS) adult cardiac surgery data specifications and the MVARC consensus document (2-4). Procedural technique and perioperative care were standard among operators and hospitals within each group. All patients were prescribed anticoagulants or antiplatelet agents after the procedure.

All transcatheter procedures were performed with a balloon-expandable transcatheter heart valve, which was implanted from transapical or transeptal access as previously described (5-7). The access route and valve size were determined based on a pre-procedural multidetector computed tomography (MDCT) and echocardiographic findings.

Surgical procedures were performed via standard sternotomy, thoracotomy, or mini-thoracotomy with cardiopulmonary bypass. One patient underwent robotic surgery through a mini-thoracotomy. Valve type was determined prior to the procedure and valve size was determined intraprocedure by calibration with proprietary valve sizers.

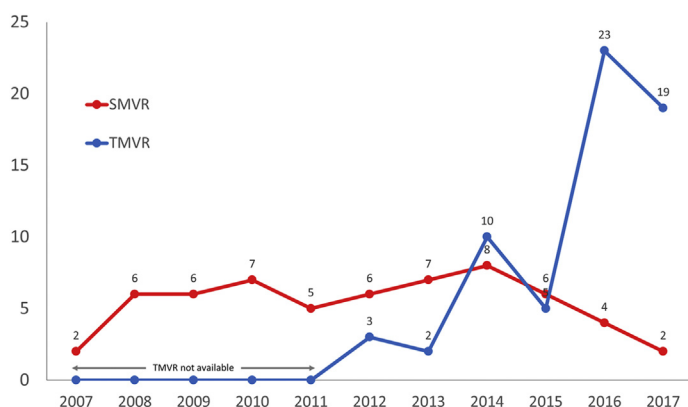
All patient information, outcomes, and complications were either collected from the electronic medical records, our local databases, or confirmed by phone contact with the patients or their families. This study was approved by the Institutional Review Board at each participating site.

STATISTICAL ANALYSIS. Continuous variables were reported as mean ± SD. Those values were tested using a 2-sample *t* test or Wilcoxon rank sum test, as appropriate. Categorical variables were examined with chi-square test or Fisher exact test. Survival curves were analyzed by the Kaplan-Meier method and compared with the log-rank test. All tests of hypotheses were 2 sided and conducted at a 0.05 level of significance. All statistical analyses were performed using IBM SPSS statistics version 24 (IBM, Armonk, New York).

RESULTS

We identified 121 redo mitral valve replacement patients (TMVR *n* = 62 and SMVR *n* = 59) who met the inclusion criteria. Baseline characteristics are listed in Table 1. TMVR patients were older and had higher mean STS Predicted Risk of Mortality scores than did SMVR patients. TMVR patients were also more likely to have lung disease, coronary artery disease, history of healed endocarditis, atrial fibrillation, and a history of a pacing device implantation than were SMVR

FIGURE 1 Change of the Number of TMVR Compared With Redo SMVR



SMVR = surgical mitral valve replacement; TMVR = transcatheter mitral valve-in-valve replacement.

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