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EDITORIAL COMMENT

Expanding the Clinical Horizon of Transcatheter Interventions

Addressing the Complications of Endocarditis

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Mitral annular abscess is a life-threatening complication of endocarditis, marked by high operative mortality and morbidity.[1] The resulting tissue necrosis can lead to the formation of a fistula or pseudoaneurysm, obligatorily requiring surgical intervention.[2] For high-risk patients unable to undergo conventional surgery, transcatheter valve intervention is emerging as a viable alternative.

PIONEERING APPROACH TO MITRAL ANNULAR ABSCESS IN INFECTIVE ENDOCARDITIS

The treatment of mitral annular abscess presents unique challenges. Even after completion of antibiotics and sterilization of the abscess cavity, effective management requires meticulous patch reconstruction to avoid complications such as myocardial infarction, left ventricular (LV)-left atrial (LA) fistula, and atrioventricular groove rupture. The morbidity and mortality rates are markedly high because of the need for complex reconstruction close to critical structures,[2] including the circumflex coronary artery, left atrial appendage, coronary sinus, and aortic valve. Transcatheter mitral valve replacement (TMVR) was initially “off the table” in patients with endocarditis and abscess cavity; these patients were excluded from all clinical TMVR trials.

In this issue of *JACC: Case Reports*, Maznyczka et al[3] present a pioneering case in which a healed mitral annular abscess and LV-LA fistula were closed using a patent foramen ovale closure device followed by Tendyne (Abbott Laboratories) TMVR to treat mitral regurgitation. Resolution of bacteremia was confirmed through positron emission tomography/computed tomography and serial negative blood cultures. The marked reduction in paravalvular regurgitation was accomplished by the combined effects of both devices. The patent foramen ovale occluder and the Tendyne valve cuff provided effective atrial sealing and closely conformed to the mitral annular contour. Neither intervention alone would have completely solved the valvular pathology; rather, the 2 technologies together provided a synergistic effect in treating the residua of complex healed endocarditis.

MULTIMODALITY IMAGING IN TMVR

As illustrated in this case, multimodality imaging is essential for TMVR planning. Preprocedural planning for TMVR relies on transthoracic echocardiography and transesophageal echocardiography (TEE) and cardiovascular computed tomographic angiography (CTA). Echocardiography assesses mitral regurgitation origin and severity and outlines essential anatomical details. High-resolution cardiovascular CTA is used to determine valve size, simulate prosthesis placement, assess papillary muscle distance, predict LV outflow tract obstruction (LVOTO), and identify optimal access paths.[4] In this case, positron emission tomography/computed tomography was also critical, confirming the clinical suspicion of no active endocarditis.

During TMVR, TEE and fluoroscopy are complementary modalities for guiding valve deployment. Real-time 2-dimensional and 3-dimensional TEE provides accurate visualization for alignment within

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FIGURE 1 Innovative Solutions to Earlier TMVR Dilemmas

DILEMMA	CHALLENGES	SOLUTIONS
Transapical access initial method of deployment TMVR	• Higher procedural mortality • Longer recovery • Increased bleeding risk	• Transseptal access in many new devices • Advanced delivery system to improve trajectory/orientation • Smaller device profile for ease of use
Sizing	• Limited device sizes • High screen failure rate owing to annular size too large / too small	• Broad range of valve sizes developed for both large and small annuli
LVOT obstruction	• Independent predictor of poor outcomes • High screen failure rate	• LVOT obstruction mitigation techniques: Leaflet modification: LAMPOON; Septal reduction: alcohol septal ablation, SESAME • New methods to measure neo-LVOT area
Mitral annular calcification	• Limited anchoring and sealing • Increased risk for LVOT obstruction • Higher risk for paravalvular leak	• Dedicated TMVR devices with advanced anchoring mechanism • Inclusion of MAC into trials to evaluate success
Prior mitral TEER	• Residual severe mitral regurgitation with high mean gradient • Prior device limiting use of additional devices	• M-TEER removal devices • Case planning for TMVR with existing devices
Complex endocarditis	• Anatomic challenges	• TMVR with adjunctive devices
Patient-centered approach	• Complex anatomical variation requiring personalized planning	• Improved multimodality imaging techniques • Specialized multidisciplinary heart team

LAMPOON = intentional laceration of the anterior mitral leaflet to prevent left ventricular outflow tract obstruction; LVOT = left ventricular outflow tract; MAC = monitored anesthesia care; M-TEER = mitral transcatheter edge-to-edge repair; SESAME = septal scoring along the midline endocardium; TEER = transcatheter edge-to-edge repair; TMVR = transcatheter mitral valve replacement.

the mitral annulus, ensuring precise device positioning. After deployment, TEE and fluoroscopy confirm device anchoring, hemodynamic stability, paravalvular regurgitation, and LVOTO, while also monitoring for complications such as pericardial effusion or left circumflex artery compression. Postprocedure, transthoracic echocardiography is used to confirm long-term device stability and functionality.

ADVANCES TO EXPAND TMVR ELIGIBILITY

TMVR has emerged as a promising treatment for mitral regurgitation, and solutions to early limitations of the technology are now being developed (Figure 1). As additional devices and solutions are developed, patient eligibility for these devices will continue to increase.

Clinical TMVR trials have an 86% screen failure rate because of 2 main issues: potential LVOTO and inadequate (too small or too large) annular size.[5] New methods for resolving these issues include more device sizes, better device design for a lower profile in the LV outflow tract, and newer algorithms for predicting LVOTO. Additionally, secondary procedures have been developed to decrease LVOTO, including alcohol septal ablation and, among other innovative techniques, a staged procedure with LVOTO reduction first, followed 30 to 90 days later by TMVR. Initial TMVR trials deployed valves using a transapical approach, which increased risk for access site bleeding, chest wall bleeding, and procedural mortality; newer devices now incorporate transseptal access to minimize procedural complications. Historically, complex mitral anatomies, including sequelae of endocarditis, could not be addressed using a TMVR device. Now, in combination with other technologies and procedures, TMVR can be a treatment option. Elongated anterior leaflet was another mechanisms by which LVOTO could develop post-deployment. Finally, mitral transcatheter edge-to-edge repair with a clip device was a contraindication to TMVR because of the perceived risk that the clip device would interfere with the sealing and anchoring of the TMVR valve. New techniques, such as ELASTA-clip (electrosurgical laceration and stabilization of mitral clips) and LAMPOON (intentional laceration of the anterior mitral leaflet to prevent LVOTO), have expanded TMVR feasibility for these challenging cases.[6-8]

Successful TMVR increasingly depends on both technological advances and the skill of operators. The growing procedural complexity underscores the importance of specialized training and expertise in structural interventions. Centers of excellence with dedicated heart teams that include interventional imagers, surgeons, and skilled implanters are essential for addressing anatomical challenges. As TMVR is extended to high-risk patients with complex anatomies, an experienced heart team becomes vital for optimal outcomes. Rather than excluding high-risk patients, clinicians can now use multimodality imaging, specialized techniques, and customized device selection to provide individualized care, emphasizing how a patient's unique anatomy and clinical profile guide device choice in structural interventions.

CONCLUSIONS

The application of TMVR in Maznyczka et al's complex endocarditis case marks a paradigm shift toward achieving surgery-like outcomes through a minimally invasive approach. This structural creativity fueled by advanced procedural techniques, enhanced imaging, specialized devices, and the advancing expertise of both imagers and implanters is transforming the treatment landscape for high-risk patients once deemed unsuitable for surgical intervention. By leveraging innovations in TMVR, clinicians can now perform precise mitral interventions that historically required open heart surgery, expanding the clinical horizon.

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