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Left Ventricular Outflow Tract Obstruction After Transcatheter Mitral Valve Replacement

How to Prevent It?

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Transcatheter mitral valve replacement (TMVR) has emerged as an alternative to surgical mitral valve replacement (SMVR) for the treatment of mitral valve disease.[1] Among its possible complications, left ventricular outflow tract (LVOT) obstruction can be a life-threatening situation and is associated with procedural morbidity and mortality. The incidence of LVOT obstruction during TVMR is relatively low. Nonetheless, in those patients with severe mitral annular calcification, the incidence of LVOT obstruction with hemodynamic compromise has been reported to be higher (9.3%).[2] On the other hand, the rates of LVOT obstruction are greater in valve-in-ring procedures (8.0%) compared with valve-in-valve procedures (2.6%).[3]

Identification of those patients at high risk of LVOT obstruction related to TVMR is crucial. Therefore, pre-procedural planning and imaging assessment including echocardiography and cardiac multislice computed tomography (MSCT) is essential. Multiple anatomic factors should be evaluated when determining the risk of LVOT obstruction after TMVR. One of the most important anatomic factors is the neo-LVOT size, defined as the estimated residual LVOT area after the implantation of the transcatheter heart valve (THV). It is a dynamic structure, the size of which changes significantly throughout the cardiac cycle, which is why it should be measured in systole. Although there is no established cutoff value that works for all of the available THVs, a neo-LVOT area >1.7 to 1.9 cm^2 appears to be safe for the implantation of a Sapien 3 (Edwards Lifesciences) or Tendyne (Tendyne Holdings) THV.[4,5] Nonetheless, further studies are required to determine a more precise threshold for the neo-LVOT area in the setting of TMVR. The aortomitral angle, the angle between the aortic annulus and the mitral annulus, also is a relevant anatomic factor, as an obtuse angle (ie, angle >90°) seems to increase the risk of LVOT obstruction. Finally, other important anatomic factors to be considered are the left ventricle size and septal wall thickness.

Once a patient is identified to be at high risk of LVOT obstruction after TMVR, a septal ablation technique may be considered to prevent this complication. Alcohol septal ablation (ASA) has been used successfully before TMVR for this purpose.[6] However, some patients might not be suitable for this technique. Radiofrequency septal ablation (RSA) is a novel technique that could be safe and effective in reducing the risk of LVOT obstruction in patients undergoing TMVR when ASA is not feasible.

Hiltner et al[7] described a case of RSA performed before transcatheter mitral valve-in-valve replacement (VIV-TMVR) in a patient with high risk of LVOT obstruction. RSA was performed successfully and without complication, under general anesthesia and guided by intracardiac echocardiography. A new cardiac MSCT after RSA showed an enlargement of the neo-LVOT. Subsequently, the patient underwent VIV-TMVR successfully, with implantation of a 26-mm Sapien 3 THV via transeptal access. Post-procedure echocardiography showed normal left ventricle function and adequate mitral valve function with no LVOT obstruction. Similarly, Killu et al[8] described a case of RSA performed to prevent LVOT obstruction in a native-valve TMVR. The case presented in this

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issue of *JACC: Case Reports* is the first report of RSA performed in a prosthetic-valve VIV-TMVR.

TMVR is a promising therapy, its numbers increasing with improvements and iterations of current devices. The risk of LVOT obstruction should be thoroughly assessed with the use of echocardiography and cardiac MSCT in all patients undergoing TMVR. Further studies are needed to determine the anatomic limitations for each of available devices. Particularly, a more precise threshold for the neo-LVOT area should be defined for each device.

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