Hybrid valve-in-valve mitral valve replacement

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CENTRAL MESSAGE

Hybrid valve-in-valve mitral valve replacement (MVR) may add another option to address the problem of left ventricular outflow tract obstruction in high-risk patients for whom repeat MVR is best avoided.

See Commentaries on pages 157, 158, and 160.

阀瓣置换术（ViV）是一种利用 Edwards SAPIEN3瓣膜（Edwards Life Sciences, Irvine, Calif）的经导管瓣膜置换术（TMVR），适用于高危患者。然而，由于瓣膜的金属框架可能导致左室流出道（LVOT）狭窄，可能会导致血流动力学不稳定性。

术前CT模拟可以帮助识别高危患者。预测的neo-LVOT面积（＜1.7cm²）可以提高敏感性和特异性，用于术后LVOT狭窄的评估。报告了一例在高危情况下进行redo瓣膜置换术（MVR）和LVOT狭窄的患者，使用ViV-TMVR和CBP进行混合型经食管手术，该技术允许对先前放置的生物瓣膜叶进行切除。

成人：瓣膜：病例报告

视频链接：Video clip is available online.

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CLINICAL SUMMARY

51-year-old female patient with severe bioprosthetic mitral stenosis was evaluated by the structural heart team. Nine years previously, she underwent MVR with a 29-mm Edwards Magna Ease bioprosthetic valve (Edwards Lifesciences) via minimally invasive right thoracotomy. Her operation was complicated by failed repair necessitating valve replacement. The initial operation and follow-up occurred at the referring hospital.

Her Society of Thoracic Surgeons score was 3.5%. However, her Charlson Comorbidity Index of 6 and Katz Index of 2 of 6 indicated she was frail, deeming her high risk for reoperative MVR. She was considered for ViV-TMVR but preoperative TMVR computed tomography revealed a projected neo-LVOT area of 0.46 cm² with a 29-mm SAPIEN 3 (Figure 1, A). ViV-TMVR would have resulted in near-total obliteration of her LVOT at end-systole (Figure 1, B). Due to her high-risk nature and concerns for prolonged cardiopulmonary bypass (CPB) required for repeat MVR, we elected to proceed with a hybrid approach via median sternotomy that allowed for resection of the anterior bioprosthetic leaflets before ViV-MVR.

Video clip is available online.
Following median sternotomy, CPB was established with aortic and bivac cannulation. After diastolic arrest, the mitral valve was exposed via Sondergaard’s groove. Using a nerve hook pierced through the leaflets of the old bioprosthetic valve, we excised the 2 leaflets adjacent to the LVOT with a #11 blade, thereby mitigating the risk of ViV-MVR induced LVOT obstruction (Video 1). Then, a 29-mm SAPIEN 3 valve was introduced into the mitral valve annulus over a wire to reduce the risk of left ventricular perforation. Under direct vision, the valve was advanced until the annular sealing cuff was just visible to ensure atrial positioning during deployment. The shaft of the delivery system was adjusted with forceps to ensure perpendicular orientation in relation to the deteriorated surgical valve. The balloon was slowly inflated until the transcatheter valve was secured within the ring of the old prosthesis. Postprocedural saline test confirmed leaflet closure and valve competence. CPB and crossclamp times were 60 and 35 minutes, respectively. Intraoperative transesophageal echocardiogram demonstrated satisfactory mitral valve positioning with no paravalvular leak or significant LVOT gradient.

The patient’s postoperative course was uneventful, and she was discharged on postoperative day 8. Transthoracic echocardiogram at 30-day follow-up showed a well-functioning bioprosthetic mitral valve with no paravalvular leak or LVOT obstruction (Figure 2). The mean gradient and peak velocity across the mitral valve were 5 mm Hg and 1.1 m/s, respectively. The mean gradient across the LVOT was 7 mm Hg with a maximum velocity of 1.3 m/s.

DISCUSSION

ViV-TMVR is a viable alternative for patients at elevated risk for repeat MVR. LVOT obstruction, however, is a feared complication associated with high mortality rates. Intentional transcatheter laceration of the anterior mitral valve leaflet to prevent LVOT obstruction (LAMPOON) with radiofrequency energy and transapical balloon-assisted translocation of the mitral anterior leaflet (BATMAN) techniques have proven feasible in preventing this problem but have yet to be replicated in larger series. The hybrid approach
described herein takes advantage of transcatheter valve replacement with short CPB time while allowing for resection of bioprosthetic leaflets to minimize the danger of LVOT obstruction. This technique also obviates the need to resect the ring of an old bioprosthesis, potentially reducing the risk of permanent pacemaker placement or injury to the circumflex artery associated with repeat MVR.1 A limitation of the procedure is the need for CPB, which may exclude applicability to extreme-risk patients. In conclusion, hybrid ViV-MVR adds another option to address the problem of LVOT obstruction in high-risk patients for whom repeat MVR is best avoided.

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