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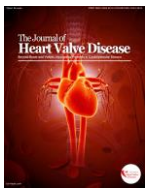

Case Report

A challenging TAVI-in-TAVI with Balloon expandable Myval and Chimney Stenting of LMCA

Article History:

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Abstract: ***Background***: Transcatheter Aortic Valve Implantation (TAVI)-in-TAVI procedures represents a significant advancement in managing patients with degenerated transcatheter heart valves (THVs). This case report details the first successful TAVI-in- TAVI procedure using the Myval THV in East India. It highlights the feasibility, safety, and effectiveness of the Myval THV in managing degenerated THVs, particularly in high-risk patients where surgical options are limited. ***Case summary***: A 68-year-old woman with a history of severe aortic stenosis, who had previously undergone TAVI with a 26 mm CoreValve (Medtronic), was considered a high-risk surgical candidate. After careful deliberation, the heart team recommended a TAVI-in-TAVI procedure as the most suitable treatment option. This marked the first TAVI-in-TAVI procedure performed in East India. The procedure was successfully carried out, involving the implantation of a 23 mm Myval (Meril Life Sciences Pvt. Ltd.) balloon-expandable THV, followed by coronary protection of LMCA using the chimney technique. The patient demonstrated immediate clinical improvement and has remained asymptomatic since the intervention. ***Conclusion***: The TAVI-in-TAVI procedure using the Myval THV is not only feasible but also a safe and effective technique for managing patients with degenerated THVs. This trailblazing procedure sets a standard for future TAVI-in-TAVI interventions and supports the broader application of the Myval THV in similar complex cases. The success of this case underscores the importance of careful procedural planning and execution, demonstrating significant advancements in transcatheter valve technology.

Keywords: Transcatheter aortic valve implantation (TAVI), TAVI-in-TAVI, Aortic stenosis, Degenerated heart valves, Balloon-expandablve valve, Myval THV.

INTRODUCTION

TAVI is also known as transcatheter aortic valve replacement (TAVR), is a highly advantageous and cost-effective intervention for patients with severe aortic valve disease who are at intermediate to high risk. It serves as a viable alternative to surgical aortic valve replacement (SAVR). The advancements in transcatheter valve procedures have been remarkable, and even though TAVI is in, in its early stages. It has already demonstrated substantial benefits in reducing morbidity and mortality. Although TAVI is frequently successful and proceeds without complications, there are instances where the THV does not yield optimal outcomes, particularly with respect to significant aortic regurgitation [1].

It is estimated that 1.4% to 2.8% of patients undergoing THV implantation will necessitate a second THV due to significant prosthesis degeneration. Over 70% of these THV-in-THV procedures are anticipated to be successful. A subsequent TAVI procedure is a proven and encouraging treatment option for patients with degenerated index THVs who have previously undergone a TAVI procedure. TAVI-in-TAVI can refine procedural techniques, improve pre-screening

and post-operative care, and help identify future needs for advancements in TAVI technology [2].

CASE PRESENTATION:

A 68-year-old female patient presented to the hospital with the chief complaints of dyspnea since 6 months aggravated since 1 month, severe generalized weakness since 15 days, bilateral lower limb swelling since 3 days. The patient's past medical history included severe Aortic stenosis, Diabetes mellitus and Hypertension. In 2017 she underwent TAVI using 26mm self-expanding CoreValve (Medtronic)

Examination:
On examination the patient was found to be conscious oriented and afebrile. Pulse rate of 69bpm, Blood pressure of 110/90mmHg, respiratory rate of 18 breaths per minute. Blood oxygen saturation was normal without supplemental oxygen therapy.

Echocardiography revealed thickened aortic valve, left ventricular hypertrophy with ejection fraction (LVEF) of 55% and mitral annular calcification. Doppler studies revealed PG/MG across aortic valve - 88/56mmHg.

Pre procedural planning based on CT images:
Risk plane of LCA from inflow of core valve is 19.6 mm. Risk plane of RCA from inflow is 23.2 mm.

Myval 23mm (balloon expandable THV) was preferred. The bench testing data of Myval indicates that crimped vs. expanded profile of 23 mm nominal is 23 vs. 17.85 mm. Height of closed cells in expanded profile of 23 mm nominal is 8.39 mm. Matching outflow of Myval THV with node 4 of core valve will make neoskirt length equal to

19.6 mm (which equals to the risk plane of LCA). However, the leaflet overhang in calcified leaflets and stenotic situation might be different than bench testing in relation to residual gradients, coronary flow and valve hemodynamics. Matching outflow of THV any higher than 19.6 mm or node 4 will be OK for RCA but not for LCA needing coronary protection for LCA. In that way we decided to protect LCA by putting a wire.

Procedure

Preparation began with ultrasound-guided femoral access, ensuring precise puncture. A guidewire was inserted into the left anterior descending artery (LAD) to secure access for subsequent coronary interventions. A pigtail catheter was placed in the left ventricle (LV) to serve as a radiographic landmark. The Myval THV was then loaded onto its delivery catheter outside the body and advanced over a stiff wire, crossing the degenerated valve into the left ventricle. The valve was carefully positioned within the degenerated valve under fluoroscopic guidance, ensuring proper alignment to avoid paravalvular leak or coronary obstruction. The balloon was inflated under rapid pacing to deploy the Myval THV. Aortic root angiography was performed immediately after deployment to confirm the correct positioning and function of the valve (figure 1). The LMCA and RCA were flowing well. The coronary wire was then removed after 10 minutes of observation and access site was closed with perclosure device. The patient developed hypotension and shock within 30 minutes of the procedure. Echocardiogrphy in the cathlab showed almost no cardiac contraction. Immediately left femoral artery was punctured and a 6F JL guiding catheter was used to canulate the LMCA through the struts of the core valve. Then a coronary wire was inserted and parked in LCX.

A coronary stent was failed to track into LMCA. So, balloon dilatation was performed in the left main coronary artery (LMCA) to prepare for stent insertion. Using the chimney stenting technique, a 4x28mm Synergy drug eluting stent was inserted from the LMCA to the LCX to ensure adequate coronary flow. Post-dilatation was done with 5x 8 mm NC balloon to ensure optimal stent expansion and apposition. Left coronary angiography was performed after stenting to evaluate the position and flow, followed by another angiography after post-dilatation to confirm the success of the intervention

(figure 2). The patient's vitals were gradually improved and cardiac contraction was restored.
A final angiographic assessment was conducted to confirm the overall success of the valve implantation and coronary interventions. The final results were documented with imaging of the left coronary artery and the newly deployed Myval THV. Post-procedure, right femoral angiography was performed to ensure there were no access site complications. Post Procedural echocardiography show immediate improvement in left ventricular ejection fraction (LVEF-55%)

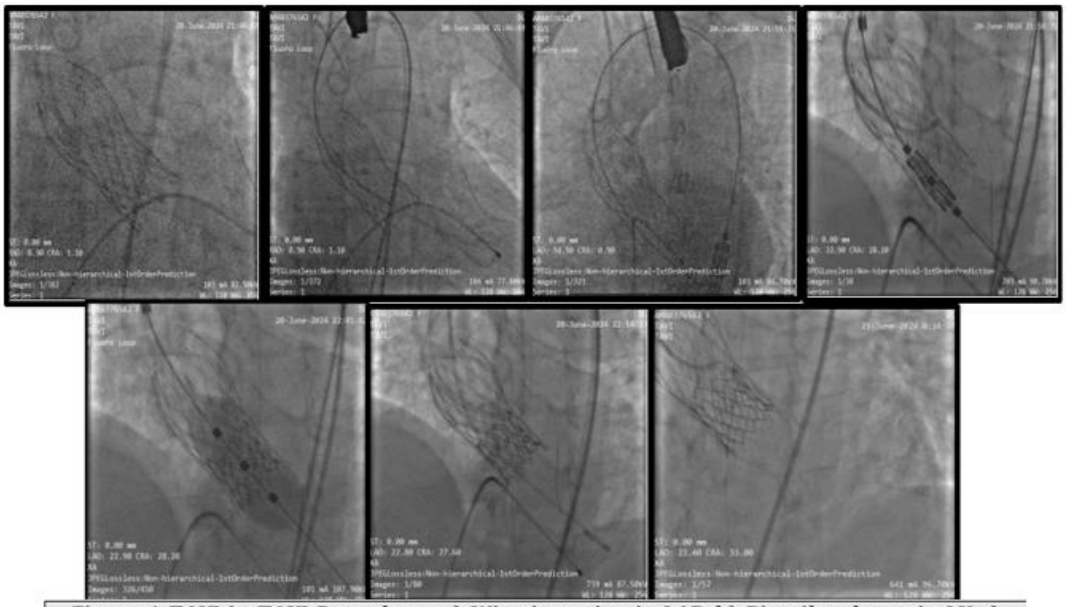

Figure 1 TAVI-in-TAVI Procedure: a) Wire insertion in LAD b) Pigtail catheter in LV c) Myval insertion d) Myval positioning e) Myval deployment f) Aortic root angio after Myval deployment g) Final result-TAVI-in-TAVI

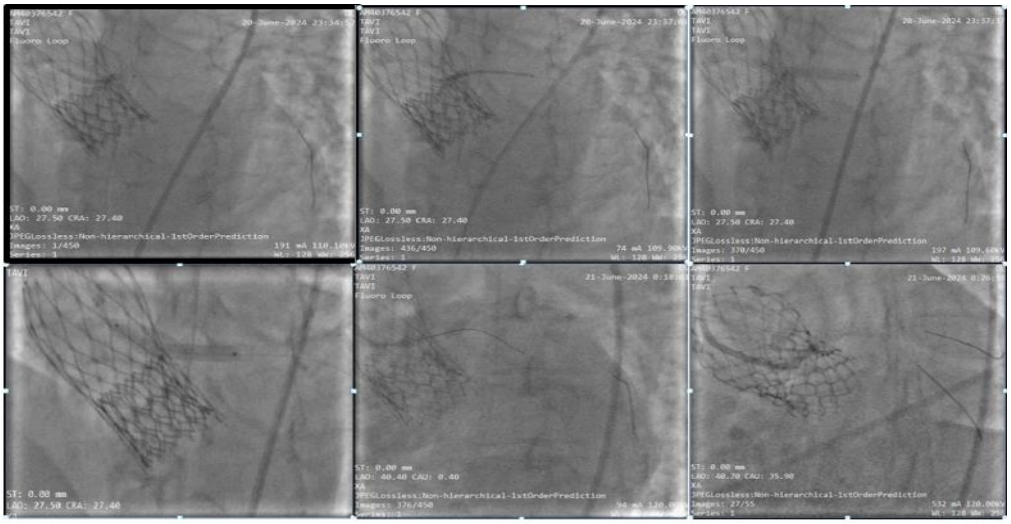

Figure 2 Chimney stenting technique: a) Pre-dilatation in LMCA b&c) Stent positioning and deployment in LMCA to LAD through valve d) Post dilatation in LMCA ostium e) Second wire insertion in left coronary f) Left Coronary Angio in LAO-Caudal View of LMCA Ostium

DISCUSSION:

TAVI is often technically successful and uneventful there are occasions when a THV fails to achieve optimal results, particularly in cases of significant aortic regurgitation. In such instances, bailout TAVI-in-TAVI can be an effective treatment option. TAVI-in- TAVI procedures present a clinical challenge when aortic regurgitation is significant but not critically severe. Extensive reports focus on elective TAVI-in-TAVI procedures, which are conducted not due to the acute failure of a TAVI device during the initial procedure, but rather weeks, months, or even years afterward [1].

This case demonstrates a successful TAVI-in-TAVI procedure. While repeated TAVI holds promise as a treatment for degenerated THVs, there is still insufficient knowledge regarding the optimal strategies and valve designs that yield the best outcomes [2]. Major peri-procedural complications in this clinical scenario have been analyzed, including bioprosthesis malpositioning, critical coronary flow obstruction, and high postoperative transaortic gradients. These potential complications necessitate careful procedural planning and execution to ensure patient safety and procedural success [3].

After careful evaluation by the cardiac team, a TAVI-in-TAVI procedure using the Myval balloon-expandable valve was selected. The decision was based on several key design features of the Myval valve: its small cell lower part enhances radial strength, while its compact size and low skirt reduce the risk of coronary artery occlusion and minimize neo-skirt formation. Additionally, the external PET skirt provides excellent sealing, effectively addressing any potential paravalvular leaks [4].

Coronary artery occlusion is a relatively rare but serious adverse event during valve- in-valve (ViV) TAVI. This risk is heightened in cases involving stentless surgical bioprostheses, stented bioprostheses with externally mounted leaflets, or in patients with a virtual transcatheter valve-to-coronary ostia distance of less than 4 mm. To mitigate such complications, an upfront coronary artery protection technique known as the "chimney technique" can be employed. ViV TAVI in degenerated surgical bioprosthetic valves is particularly challenging and complex, requiring thorough pre-procedural evaluation to predict and manage serious complications [5].

In this case, the patient had a potential risk of coronary occlusion, predominantly affecting the left main coronary artery, as is common in the majority of coronary occlusion cases. The plan was to protect it using the chimney technique, which creates a stented channel ensuring sufficient coronary flow and perfusion in the event of coronary occlusion. Although the chimney technique is a recognized bailout procedure during TAVI, its use remains relatively infrequent, accounting for only 0.5- 2.2% of all cases. Studies have demonstrated that anticipating and employing this technique can significantly reduce the risk of major cardiovascular complications [5]. Later the patient was discharged in a hemodynamically stable condition. This case highlights the strengths and advantages of using a balloon-expandable valve in valve- in-valve TAVI procedures. It stands as one of the few documented instances of a Myval valve being used for such interventions, demonstrating the feasibility and effectiveness of utilizing a Myval valve in these procedures.

CONCLUSION:

This case report highlights the use of the Myval THV in a TAVI-in-TAVI procedure, marking the first of its kind in East India. The successful outcome demonstrates that TAVI-in-TAVI using the Myval THV is not only feasible but also a safe and effective technique. The procedure led to excellent hemodynamic and clinical results, showcasing the advancements in THV technology and its application in complex clinical scenarios. This case sets a significant precedent for future TAVI-in-TAVI interventions, demonstrating the evolving capabilities of new generation balloon- expandable valves in addressing the needs of patients with degenerative THVs and also underscores the potential for wider application of the Myval THV in similar cases.

REFERENCES:

1. Giordano A, Mangieri A, Attizzani GF, Baldetti L, Pagnesi M, Tchetche D, et al. Features and outcomes of bailout repeat transcatheter aortic valve implantation (TAVI): the Bailout Acute TAVI-in-TAVI to Lessen Events (BATTLE) international registry. Clin Res Cardiol. 2024;113(1):68–74.
2. Parma R, Araszkiewicz A, Wanha W, Mysiak A, Koźluk E, Huczek Z, et al. Procedural and clinical outcomes of patients undergoing a TAVI in TAVI procedure: Rationale and design of the multicentre, prospective, observational ReTAVI registry. Eur J Clin Invest. 2024;e14241.
3. Voudris V, Vrachatis DA, Vassilopoulos C, Deftereos G, Papoutsidakis N, Tsigkas G, et al. Repeated transcatheter aortic valve implantation for the treatment of a degenerated transcatheter aortic valve implantation valve (valve-in-valve technique): a case report. Eur Heart J Case Rep. 2020;4(6):1–6.
4. Mihailovič PM, Marković N, Marković A, Lončar B, Vukmirović M, Stanojević D, et al. Case report: A complex case of valve-in-valve TAVI and left bundle branch pacing for severe aortic regurgitation with partially corrected type A aortic dissection and low ejection fraction. Front Cardiovasc Med. 2023;10:1206811.
5. Bunc M, Vitez L, Ussia GP. Valve-in-valve transcatheter aortic valve implantation with acute left and right coronary artery occlusion: a case report. J Med Cases. 2022;13(4):172.