Case Report

Motorized transcatheter aortic valve implantation in a high-risk patient with severe aortic stenosis: A case report

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Abstract

Background: Transcatheter aortic valve implantation (TAVI) is an effective therapy for severe aortic stenosis, especially in patients with high surgical risk due to complex cardiac history. Motorised valve delivery systems enable precise deployment, improving procedural outcomes.

Case Presentation: We report a 65-year-old male with newly diagnosed diabetes mellitus, a history of coronary artery disease (triple-vessel disease), status post-primary PCI to the left anterior descending artery (LAD) following an evolved anterior wall myocardial infarction (AWMI) with prior cardiac resuscitation, and old multifocal cerebrovascular infarcts. The patient also had recovered from acute decompensated heart failure and moderate left ventricular dysfunction. During follow-up, he was found to have severe calcific aortic stenosis with severe aortic regurgitation. On admission, he was conscious and oriented, pulse 74 bpm, BP 160/90 mmHg, S1/S2 audible, and bilateral air entry normal. He underwent successful transfemoral motorised TAVI under fluoroscopic and ultrasound guidance. Pre-procedure gradient was 80/60 mmHg. Following balloon pre-dilatation with an 18 mm Z-MED II balloon, the motorised valve was deployed with optimal positioning. Post-procedure gradient was reduced to 13/6 mmHg with minimal paravalvular leak. The patient had an uneventful recovery and remained asymptomatic at 30-day follow-up.

Conclusion: This case illustrates the feasibility, safety, and efficacy of motorised TAVI in patients with severe aortic stenosis and multiple high-risk comorbidities, including prior myocardial infarction, PCI, cerebrovascular disease, and moderate LV dysfunction.

Keywords: Motorised TAVI; Transcatheter aortic valve implantation; Severe aortic stenosis, Coronary artery disease

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1. Introduction

Severe aortic stenosis is associated with high morbidity and mortality if untreated. Transcatheter aortic valve implantation (TAVI) has emerged as a safe and effective alternative to surgical aortic valve replacement (SAVR) in patients with elevated surgical risk, supported by randomized trials and international guidelines 1–4. Motorized valve delivery systems allow controlled stepwise deployment and repositioning, thereby reducing complications such as malpositioning, paravalvular regurgitation, and conduction abnormalities [5,6,7]. Patients with complex cardiac histories, including prior myocardial infarction, percutaneous coronary intervention, cerebrovascular disease, and left ventricular dysfunction, represent a particularly high-risk group in whom precise procedural control is critical to optimize outcomes [4,8].

2. Case Presentation

A 65-year-old male with newly diagnosed type 2 diabetes mellitus presented for cardiovascular evaluation. His medical history was significant for an evolved anterior wall myocardial infarction one month prior with successful cardiac resuscitation, triple-vessel coronary artery disease status post-coronary angiography and primary percutaneous coronary intervention to the left anterior descending artery, old multifocal cerebrovascular infarcts, and acute decompensated heart failure that had subsequently recovered. Transthoracic echocardiography during follow-up revealed severe calcific aortic stenosis with concomitant severe aortic regurgitation and moderate left ventricular dysfunction (LVEF 40–45%).

On admission, he was conscious and oriented with a pulse of 74 beats per minute and blood pressure of 160/90 mmHg. Heart sounds were audible, lung auscultation was normal, and there were no overt signs of heart failure. Diagnostic assessment with echocardiography confirmed severe aortic stenosis and regurgitation with a pre-procedural peak and mean gradient of 80/60 mmHg. Computed tomography angiography demonstrated favorable annular dimensions and suitable transfemoral access for transcatheter intervention.

The patient underwent motorized transcatheter aortic valve implantation via right radial artery and right femoral artery and vein access using the modified Seldinger technique under fluoroscopic and ultrasound guidance. Femoral access was pre-closed using a ProGlide device. Aortography confirmed severe calcific aortic valve stenosis with severe regurgitation. A Lunderquist extra-stiff guidewire was positioned in the left ventricular apex, and balloon predilatation was performed using an 18-mm Z-MED II balloon. The motorized transcatheter valve was deployed with controlled stepwise expansion.

Post-procedure, the patient had a residual peak and mean gradient of 13/6 mmHg with minimal paravalvular leak and no evidence of coronary obstruction or conduction disturbances. Hemostasis was achieved via pre-closed femoral access. The post-procedural course was uneventful; the patient was mobilized within 24 hours and discharged on day 3. At 30-day follow-up, he remained asymptomatic (New York Heart Association Class I) with stable prosthetic valve function.

3. Discussion

Motorized transcatheter aortic valve implantation is an effective minimally invasive alternative to surgical aortic valve replacement for patients with severe aortic stenosis, particularly those at high or intermediate surgical risk 1–4. Unlike conventional surgery, motorized TAVI uses controlled stepwise expansion to deploy the prosthetic valve with

high precision, minimizing the risks of malposition, paravalvular regurgitation, and conduction disturbances [5,6,7]. This precision is especially advantageous in patients with complex anatomy, severe valvular calcification, or mixed aortic valve disease [9,10].

The indications for motorized TAVI include symptomatic severe aortic stenosis, mixed valvular disease, and patients with moderate left ventricular dysfunction or comorbidities that increase the risk of open-heart surgery [1,2]. It is also favored in individuals most performed infarction, multivessel coronary artery disease, previous cardiac surgery, cerebrovascular disease, frailty, or other contraindications to surgical intervention [4,11]. The procedure is most performed via transfemoral access under fluoroscopic and echocardiographic guidance, with balloon pre-dilatation reserved for selected cases [8].

Post-procedural outcomes following TAVI are excellent, with procedural success rates exceeding 95%, low incidence of significant paravalvular leak, and 30-day mortality typically below 5% in high-risk populations [3,4,11]. Despite its minimally invasive nature, TAVI is associated with potential complications, including paravalvular leak, vascular injury, conduction disturbances requiring permanent pacemaker implantation, coronary obstruction, stroke, and valve malposition [6,10]. Careful patient selection, meticulous preprocedural imaging, and refined implantation techniques are essential to mitigate these risks [8].

In the present case, the patient had severe calcific aortic stenosis with concomitant severe regurgitation, moderate left ventricular dysfunction, and multiple comorbidities including prior myocardial infarction, triple-vessel coronary artery disease, and cerebrovascular infarcts, placing him at high surgical risk[1,4]. Motorized TAVI was therefore chosen to minimize procedural risk while providing precise valve placement, rapid hemodynamic improvement, and a short recovery period. The stepwise expansion offered by the motorized delivery system was particularly advantageous given the patient's complex valve anatomy and preserved conduction system [5,7].

The excellent procedural and early clinical outcomes in this case further demonstrate the feasibility, safety, and clinical benefit of motorized TAVI in complex high-risk patients.

4. Conclusion

Motorized TAVI is safe and effective treatment for severe aortic stenosis in high-risk patients with complex cardiac histories, offering precise valve deployment, favorable hemodynamics, and excellent short-term outcomes.

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