



Case Report

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Recovery of Left Ventricular Function After Staged Treatment of Ischemic Cardiomyopathy and Low-Flow Low-Gradient Aortic Stenosis: A Case Report

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Abstract

Heart failure with reduced ejection fraction (HFrEF), severe coronary artery disease, and low-flow, low-gradient (LFLG) severe aortic stenosis frequently coexist in elderly patients and present significant diagnostic and therapeutic challenges. Determining the relative contribution of ischemia, valvular disease, and myocardial dysfunction to the clinical presentation is often difficult and may influence treatment strategy. We report the case of an 82-year-old man with type 2 diabetes mellitus, chronic kidney disease, and symptomatic HFrEF (NYHA class III) who presented with severely impaired left ventricular systolic function (LVEF 12–15%). Transthoracic echocardiography demonstrated LFLG severe aortic stenosis, while coronary angiography revealed severe two-vessel coronary artery disease consisting of a subtotal stenosis of the left anterior descending artery (LAD) and a critical calcified ostial stenosis of the right coronary artery (RCA). Following Heart Team discussion, a staged treatment strategy was adopted. Guideline-directed medical therapy, including dapagliflozin, was initiated and optimized. The patient subsequently underwent successful percutaneous coronary intervention (PCI) of the LAD, followed by rotational atherectomy and PCI of the heavily calcified RCA. Despite gradual improvement in left ventricular function, severe symptomatic aortic stenosis persisted. Computed tomography demonstrated extensive valvular calcification with an Agatston score of 4648 (calcium volume 1903 mm³), supporting the diagnosis of true severe aortic stenosis. Transfemoral transcatheter aortic valve implantation (TAVI) with a 29-mm balloon-expandable Myval valve was successfully performed. At follow-up, the patient demonstrated marked clinical improvement with complete resolution of heart failure symptoms. Left ventricular ejection fraction improved progressively from 12–15% at baseline to 45% following completion of the staged treatment strategy. This case highlights the importance of a multidisciplinary Heart Team approach and demonstrates that substantial recovery of left ventricular function may be achieved through systematic application of contemporary heart failure therapy, complete coronary revascularization, and transcatheter valve intervention.

Keywords: Low-Flow Low-Gradient Aortic Stenosis, Heart Failure with Reduced Ejection Fraction (HFrEF), Transcatheter Aortic Valve Implantation (TAVI), Coronary Artery Disease, Percutaneous Coronary Intervention (PCI), Rotational Atherectomy, Guideline-Directed Medical Therapy, Left Ventricular Ejection Fraction, Heart Team

Introduction

Heart Failure with Reduced Ejection Fraction (HFrEF) and severe aortic stenosis frequently coexist in elderly patients and are associated with poor clinical outcomes. The presence of Low-Flow, Low-Gradient (LFLG) severe aortic stenosis represents a particular diagnostic and therapeutic challenge, as left ventricular dysfunction may both contribute to and result from the severity of valvular obstruction. In patients with concomitant coronary artery disease, determining the relative contribution of myocardial ischemia, left

ventricular remodeling, and valvular heart disease to the clinical presentation is often difficult. [1,2] Contemporary management of such patients requires a multidisciplinary approach integrating Guideline-Directed Medical Therapy (GDMT) [3,4], complete coronary revascularization, and timely valve intervention [5-7]. While each therapeutic strategy has independently demonstrated prognostic benefit, data regarding the cumulative effect of sequential treatment in complex patients with severe left ventricular dysfunction remain limited. We present the case of a patient



with ischemic cardiomyopathy, severe left ventricular systolic dysfunction, and low-flow, low-gradient severe aortic stenosis who underwent staged management consisting of optimization of heart failure therapy, complete coronary revascularization [8,9], and Transcatheter Aortic Valve Implantation (TAVI), resulting in substantial recovery of left ventricular function and clinical status [10,11].

Case Presentation

An 82-year-old male patient was admitted to our department due to progressive exertional dyspnea and reduced functional capacity. His medical history included arterial hypertension, type 2 diabetes mellitus, chronic kidney disease (serum creatinine 137µmol/L, estimated glomerular filtration rate 44 mL/min/1.73

m²), and chronic heart failure. Despite treatment with torasemide 10 mg daily, nebivolol 5 mg daily, and glimepiride 4 mg daily, the patient remained symptomatic and was classified as New York Heart Association (NYHA) functional class III.

On admission, he was hemodynamically stable with a blood pressure of 130/70 mmHg and a heart rate of 87 beats/min. Transthoracic echocardiography demonstrated a severely dilated left ventricle with profound systolic dysfunction and a Left Ventricular Ejection Fraction (LVEF) of 12–15%. Moderate functional mitral regurgitation was present. Assessment of the aortic valve revealed low-flow, low-gradient severe aortic stenosis with a peak/mean transvalvular gradient of 58/31mmHg, an aortic valve area of approximately 0.7 cm², and an indexed aortic valve area of 0.40 cm²/m² (Figures 1,2).

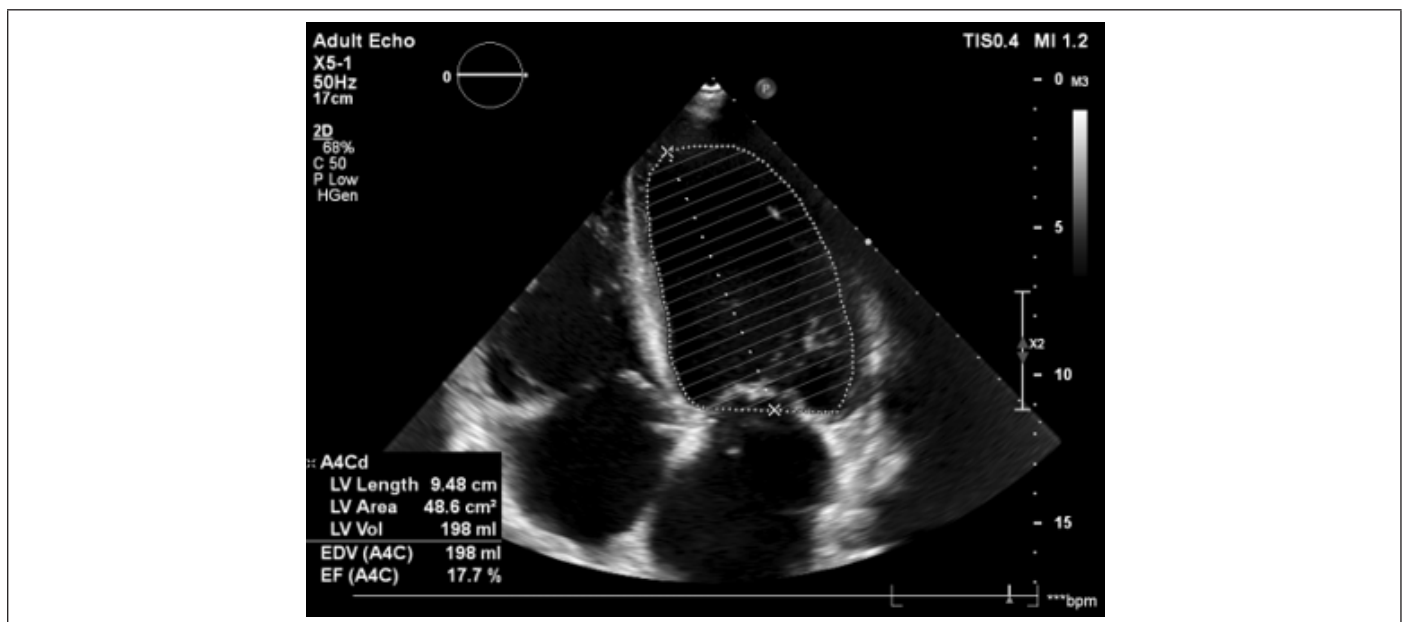


Figure 1: Baseline transthoracic echocardiography demonstrating severe left ventricular dysfunction.

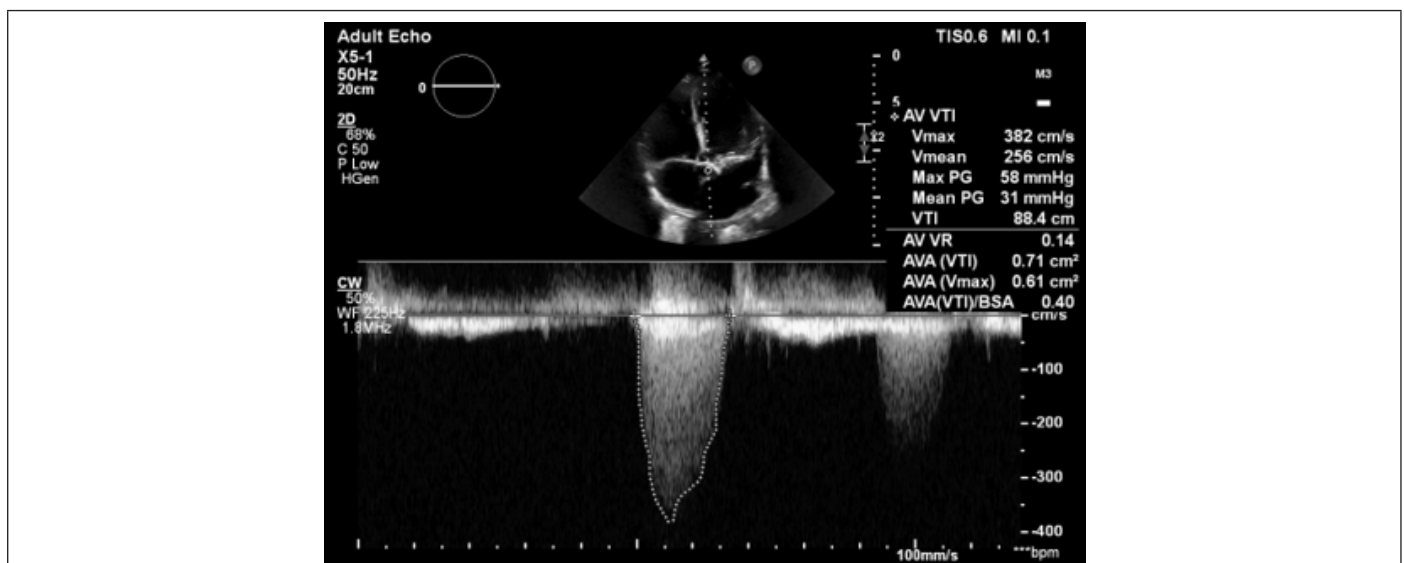


Figure 2: Low-flow, low-gradient severe aortic stenosis.

Given the severity of left ventricular dysfunction and the suspicion of a significant ischemic component, coronary angiography was performed. The examination revealed severe two-vessel coronary artery disease consisting of a subtotal stenosis

of the Left Anterior Descending Artery (LAD) and a critical ostial stenosis of a heavily calcified Right Coronary Artery (RCA) (Figures 3,4).

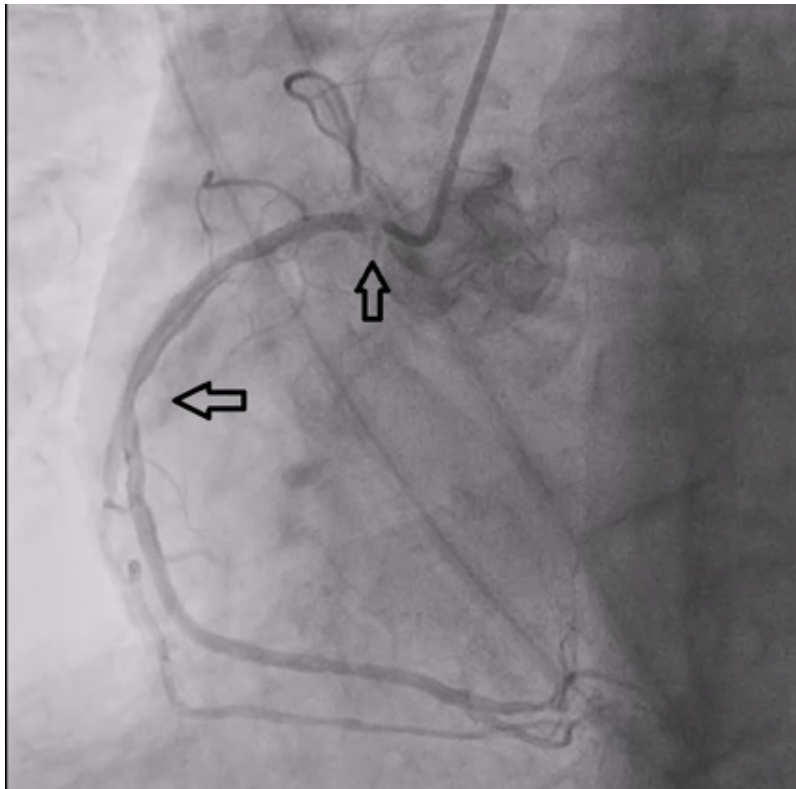


Figure 3: Baseline coronary angiography of RCA.

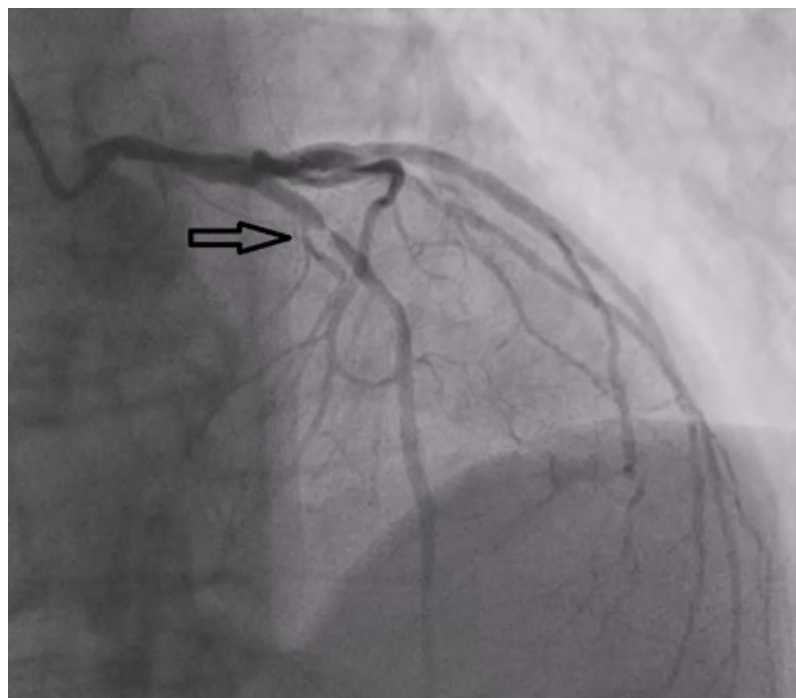


Figure 4: Baseline coronary angiography of LAD.

The patient's case was discussed by the local Heart Team. Due to the coexistence of advanced heart failure, severe coronary artery disease, and low-flow, low-gradient severe aortic stenosis, a staged therapeutic strategy was adopted. Guideline-directed medical therapy for heart failure was initiated and optimized, including sacubitril/valsartan, bisoprolol, spironolactone, dapagliflozin,

and loop diuretic therapy according to clinical status. The first interventional step consisted of percutaneous coronary intervention of the LAD. Following lesion preparation with balloon predilatation, a 2.75 × 32 mm drug-eluting stent was successfully implanted with restoration of TIMI 3 flow and an excellent angiographic result (Figures 5,6).



Figure 5: Percutaneous coronary intervention of the left anterior descending artery.

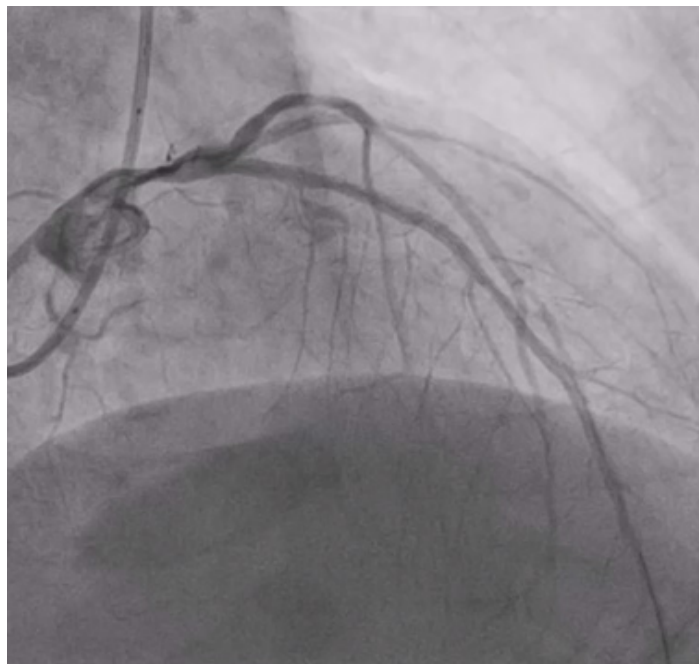


Figure 6: Final result after stenting LAD.

One month later, the patient was readmitted for treatment of the residual RCA lesion. Repeat echocardiography demonstrated a modest improvement in LVEF from 15% to approximately 22%; however, significant symptoms persisted (Figure 7).

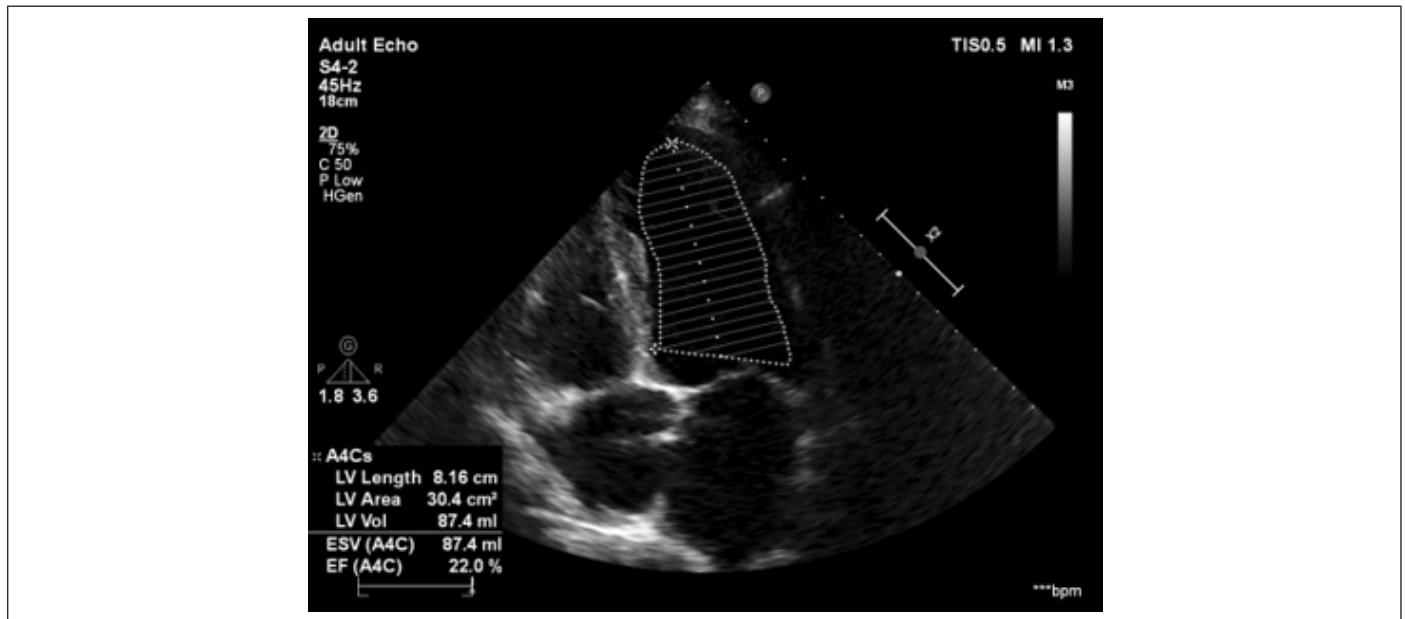


Figure 7: Echocardiography after one month - EF has increased from 15% to 22%.

Due to extensive coronary calcification, rotational atherectomy of the RCA was performed, followed by successful implantation of drug-eluting stents in the ostial and mid segments (Figures 8,9).

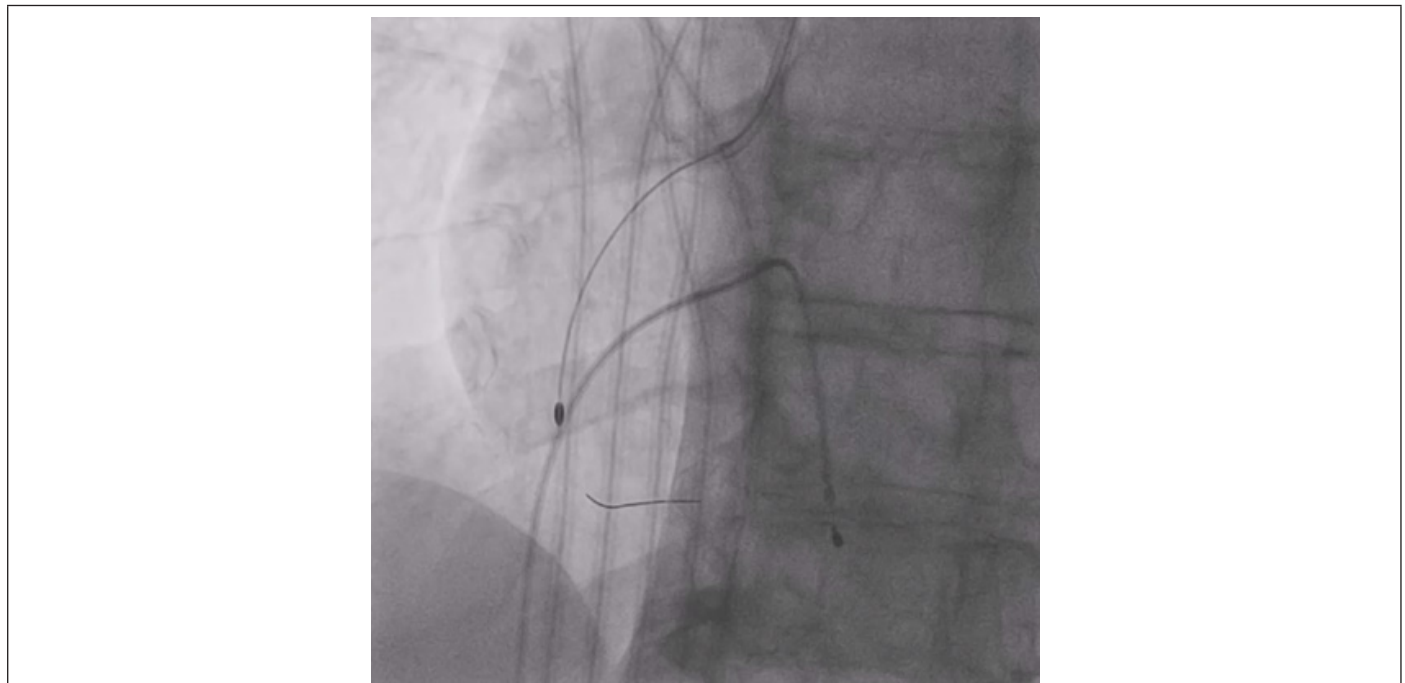


Figure 8: Rotational atherectomy and stenting of the right coronary artery.

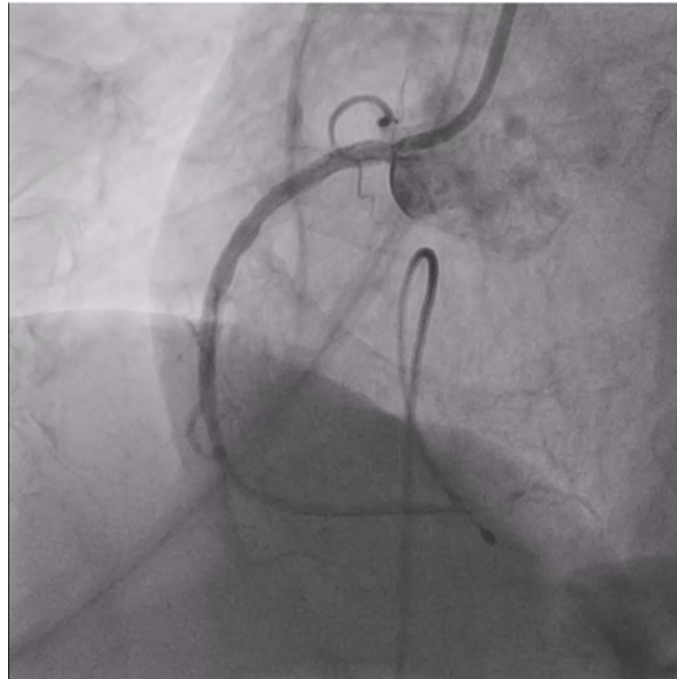


Figure 9: Final result in the RCA after stenting.

At reassessment one month after complete coronary revascularization, LVEF had further improved to approximately 27%. Nevertheless, the patient remained symptomatic and severe aortic stenosis persisted (Figure 10).

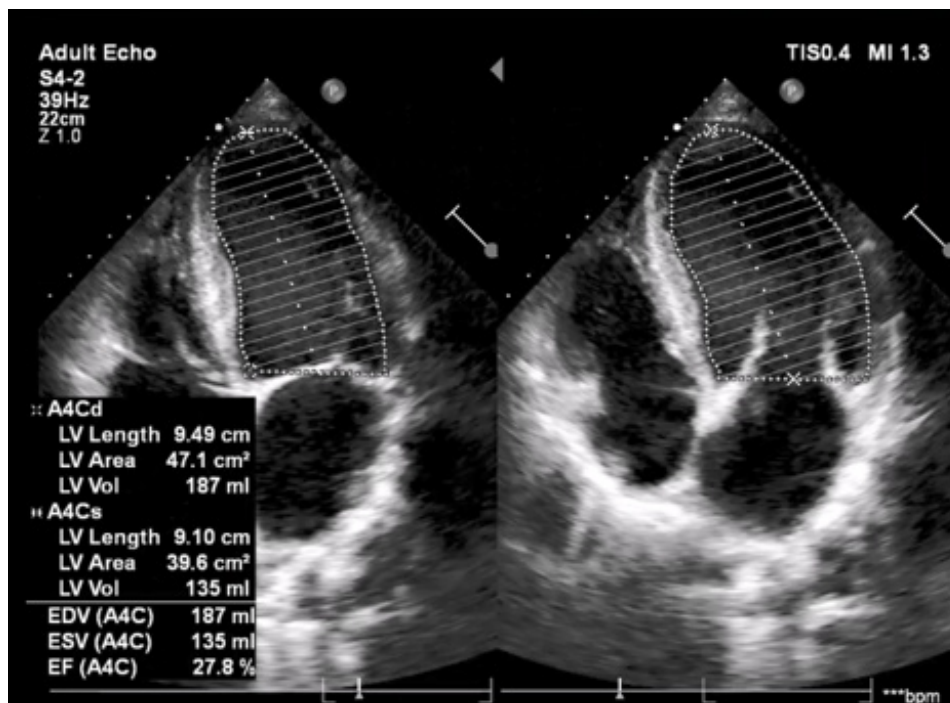


Figure 10: One month after complete coronary revascularization, LVEF increased from 22% to 27%.

Given the patient's age, comorbidities, and elevated surgical risk (EuroSCORE II approximately 12%), Transcatheter Aortic Valve Implantation (TAVI) was recommended by the Heart Team. Preprocedural computed tomography demonstrated extensive

valvular calcification with an Agatston calcium score of 4648 (calcium volume 1903 mm³), strongly supporting the diagnosis of true severe aortic stenosis. The iliofemoral vessels were considered suitable for transfemoral access [12] (Figures 11,12).

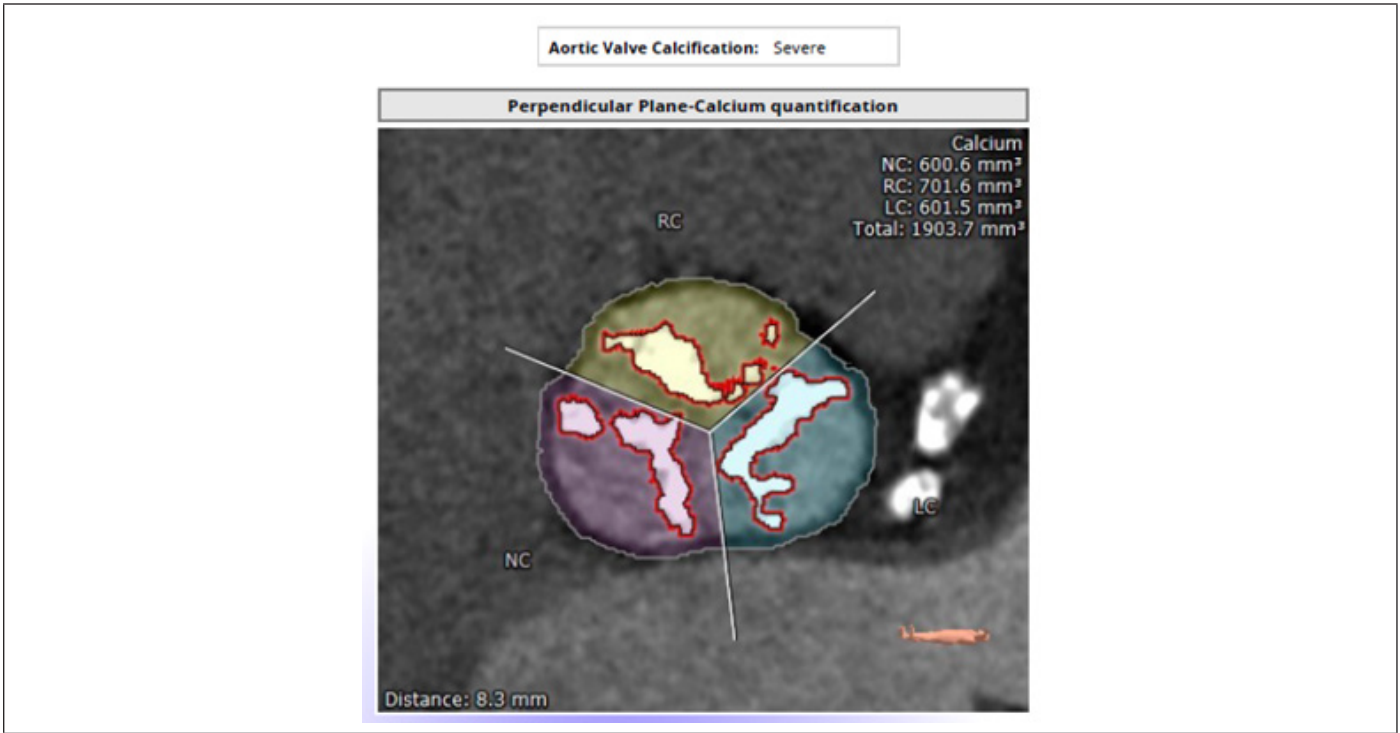


Figure 11: Computed tomography assessment demonstrating severe aortic valve calcification.

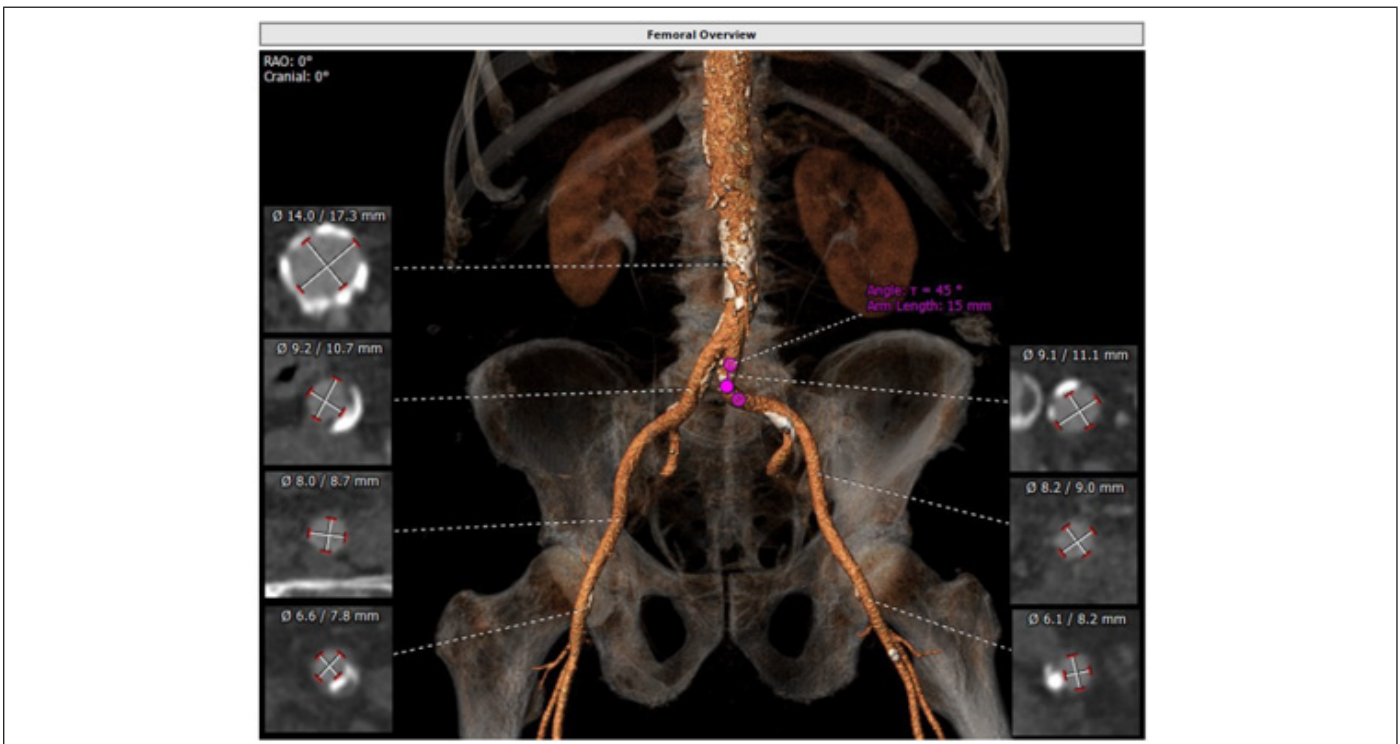


Figure 12: Suitable iliofemoral vessels for transfemoral access.

TAVI was successfully performed using a 29-mm balloon-expandable Myval transcatheter heart valve via transfemoral access. Balloon predilatation was performed under rapid ventricular

pacing, followed by successful valve deployment. Final aortography demonstrated optimal prosthesis position with only trivial residual aortic regurgitation (Figures 13,14).

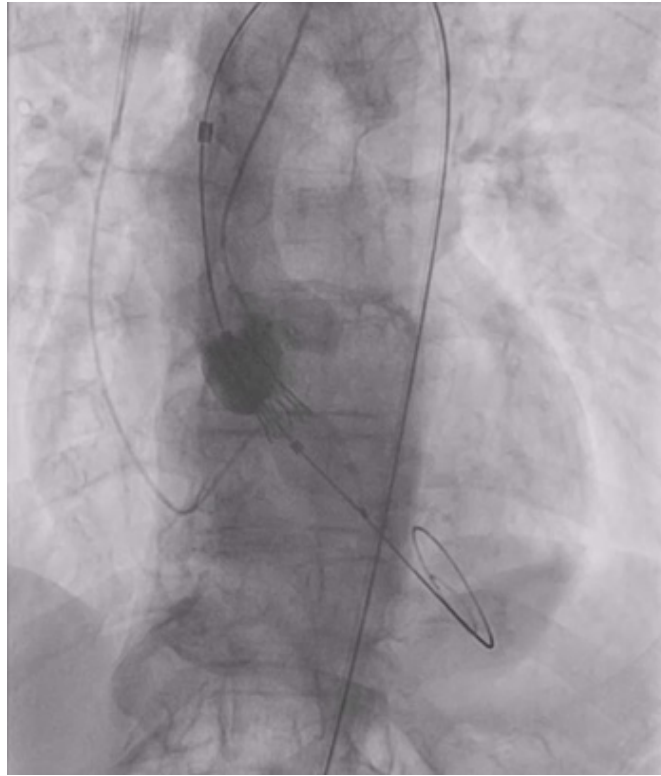


Figure 13: Transcatheter aortic valve implantation with a 29-mm Myval valve.

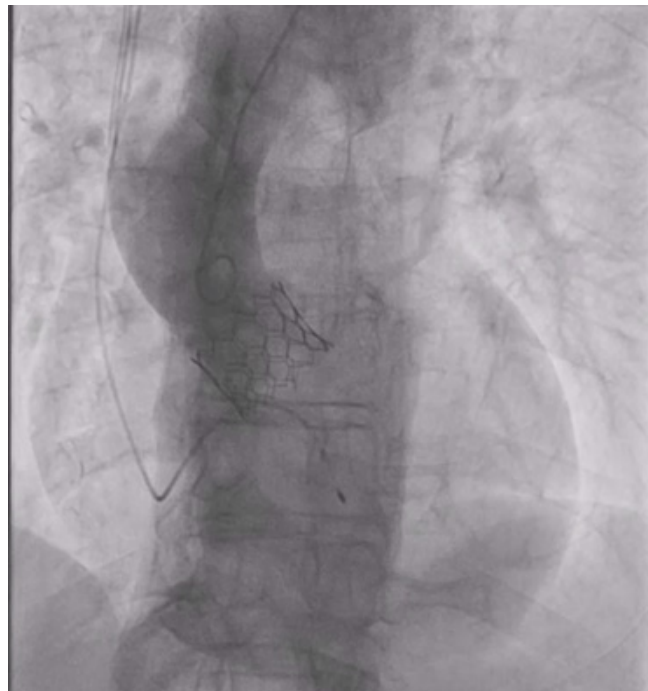


Figure 14: Final result after TAVI.

At follow-up one month after TAVI and approximately four months after initiation of the staged treatment strategy, the patient reported marked symptomatic improvement. He remained free of heart failure symptoms and was able to perform his usual daily activities without limitation. Repeat transthoracic echocardiography demonstrated substantial recovery of left ventricular systolic

function, with LVEF improving to approximately 45%. Due to the significant improvement in ventricular function, the previously considered indication for cardiac resynchronization therapy was no longer present. The progressive improvement in left ventricular systolic function observed after each therapeutic intervention is summarized in Table 1.

Table 1: Evolution of clinical and echocardiographic parameters during staged treatment.

STAGE	LVEF (%)	NYHA	MAIN INTERVENTION
Baseline	15	III	Initial assessment
After PCI - LAD	22	III	LAD stenting
After rotablation - RCA	27	II - III	RCA rotablation + PCI
After TAVI	45	I	TAVI implantation

Discussion

This case illustrates the challenges associated with the management of patients presenting with severe left ventricular systolic dysfunction, significant coronary artery disease, and Low-Flow, Low-Gradient (LFLG) severe aortic stenosis. Determining the relative contribution of each pathology to the patient's clinical presentation is often difficult and may significantly influence therapeutic decision-making.

LFLG aortic stenosis represents a particularly challenging clinical entity. In patients with severely impaired left ventricular function, reduced stroke volume may lead to lower transvalvular gradients despite the presence of truly severe valve obstruction. Consequently, distinguishing true severe aortic stenosis from pseudo-severe disease is essential. In our patient, the combination of a markedly reduced aortic valve area and extensive valvular calcification with an Agatston score of 4648 strongly supported the diagnosis of true severe aortic stenosis.

An additional challenge was the presence of severe two-vessel coronary artery disease. Significant ischemic burden may itself lead to profound impairment of left ventricular systolic function and may also contribute to the low-flow state responsible for the atypical hemodynamic presentation of aortic stenosis. Therefore, it was unclear at presentation whether the dominant mechanism of ventricular dysfunction was ischemic, valvular, or a combination of both.

For this reason, a staged treatment strategy was selected. Initial optimization of Guideline-Directed Medical Therapy (GDMT) was performed in accordance with contemporary heart failure recommendations. The treatment regimen included an angiotensin

receptor-neprilysin inhibitor, beta-blocker, mineralocorticoid receptor antagonist, and dapagliflozin. SGLT2 inhibitors have become one of the four foundational pillars of HFrEF treatment and have consistently demonstrated reductions in heart failure hospitalization and cardiovascular mortality across a broad spectrum of patients with reduced ejection fraction.

The first procedural step consisted of revascularization of the LAD, followed by complete revascularization with rotational atherectomy and PCI of the heavily calcified RCA. Notably, a gradual improvement in left ventricular systolic function was observed following each stage of treatment, with LVEF increasing from 15% to 22% after LAD PCI and subsequently to 27% following complete coronary revascularization. These findings suggest that myocardial ischemia represented an important contributor to ventricular dysfunction.

Despite complete revascularization and optimized medical therapy, the patient remained symptomatic and severe aortic stenosis persisted. This observation suggested that coronary artery disease alone could not fully explain the clinical picture. The decision to proceed with TAVI was therefore based on persistent symptoms, objective evidence of severe valve obstruction, and elevated surgical risk.

The most remarkable finding in this case was the substantial recovery of ventricular function following TAVI, with LVEF increasing to 45% during follow-up. While it is impossible to determine the exact contribution of each therapeutic intervention, the sequential pattern of improvement suggests a cumulative and synergistic effect of contemporary heart failure therapy, complete coronary revascularization, and correction of severe valvular obstruction.

This case highlights the importance of a multidisciplinary Heart Team approach in complex patients with mixed ischemic and valvular cardiomyopathy. Rather than viewing coronary artery disease, heart failure, and aortic stenosis as isolated entities, successful treatment often requires a comprehensive strategy addressing all contributing mechanisms. Even in patients presenting with profoundly depressed left ventricular function, substantial recovery may be achievable when potentially reversible causes are systematically identified and treated. The progressive improvement in LVEF observed after each therapeutic step (15% → 22% → 27% → 45%) provides a unique illustration of the cumulative effect of contemporary multimodal treatment in advanced heart failure.

Conclusion

This case demonstrates that severe left ventricular systolic dysfunction in elderly patients is frequently multifactorial and may result from the combined effects of ischemic heart disease, advanced heart failure, and severe valvular disease. In such patients, identifying and addressing all potentially reversible contributors is crucial.

A staged treatment strategy consisting of optimization of guideline-directed medical therapy, complete coronary revascularization, and transcatheter aortic valve implantation resulted in substantial clinical and echocardiographic improvement, with recovery of left ventricular ejection fraction from 15% to 45%.

The present case highlights the importance of a multidisciplinary Heart Team approach and illustrates that even patients with profoundly impaired ventricular function may experience significant functional recovery when contemporary multimodal therapy is applied in a systematic and individualized manner.

Conflict of Interest

The authors declare that there are no financial, personal, or professional conflicts of interest that could have influenced the work reported in this manuscript.

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References

- McDonagh TA, Metra M, Adamo M, Gardner RS, Baumbach A, et al. (2023) 2023 Focused Update of the 2021 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure. *Eur Heart J* 44 (37): 3627-3639.
- McMurray JJV, Solomon SD, Inzucchi SE, Køber L, Kosiborod MN, et al. (2019) Dapagliflozin in Patients with Heart Failure and Reduced Ejection Fraction. *N Engl J Med* 381(21): 1995-2008.
- Packer M, Anker SD, Butler J, Filippatos G, Pocock SJ, et al. (2020) Cardiovascular and Renal Outcomes with Empagliflozin in Heart Failure. *N Engl J Med* 383(15): 1413-1424.
- I Simova, D Nikolov*, B Angelova, G Todorova, E Borisova Hristova, et al. (2025) Early Detection and Intervention in Chronic Kidney Disease - The Role of Dapagliflozin in Patients with Microalbuminuria. *Am J Biomed Sci & Res* 26(2).
- Vahanian A, Beyersdorf F, Praz F, Milojevic M, Baldus S, et al. (2022) 2021 ESC/EACTS Guidelines for the management of valvular heart disease. *Eur Heart J* 43(7): 561-632.
- Pibarot P, Dumesnil JG (2012) Low-flow, low-gradient aortic stenosis with normal and depressed left ventricular ejection fraction. *J Am Coll Cardiol* 60(19): 1845-1853.
- Pawade TA, Clavel MA, Tribouilloy C, Dreyfus J, Mathieu T, et al. (2018) Computed Tomography Aortic Valve Calcium Scoring in Patients with Aortic Stenosis. *Circ Cardiovasc Imaging* 11(3): e007146.
- Velazquez EJ, Lee KL, Jones RH, Al-Khalidi HR, Hill JA, et al. (2016) Coronary-Artery Bypass Surgery in Patients with Ischemic Cardiomyopathy. *N Engl J Med* 374(16): 1511-1520.
- Perera D, Clayton T, Petrie MC, Greenwood JP, O'Kane PD, et al. (2022) Percutaneous Revascularization for Ischemic Left Ventricular Dysfunction. *N Engl J Med* 387(15): 1351-1360.
- Leon MB, Smith CR, Mack MJ, Makkar RR, Svensson LG, et al. (2016) Transcatheter or Surgical Aortic-Valve Replacement in Intermediate-Risk Patients. *N Engl J Med* 374(17): 1609-1620.
- Mack MJ, Leon MB, Smith CR, Miller DC, Moses JW, et al. (2015) 5-Year Outcomes of Transcatheter Aortic Valve Replacement or Surgical Aortic Valve Replacement for High Surgical Risk Patients. *JAMA* 313(10): 1019-1028.
- Clavel MA, Messika-Zeitoun D, Pibarot P, Aggarwal S, Malouf J, et al. (2013) The Complex Nature of Discordant Severe Calcified Aortic Valve Disease Grading: New Insights From Combined Doppler Echocardiographic and Computed Tomographic Study. *J Am Coll Cardiol* 62(24): 2329-2338.