TPM Vol. 32, No. S3, 2025
ISSN: 1972-6325
https://www.tpmap.org/

Open Access

ANAESTHESIA MANAGEMENT OF TRANSCATHETER AOR2C VALVE REPLACEMENT IN AN OCTOGENARIAN WITH SEVERE AOR2C STENOSIS AND MUL2SYSTEM COMORBIDI2ES: A CASE REPORT

DR AARTHI.C[1] , DR R LAKSHMI[2] , DR.BHARATHI[3], DR. K. RAMESH[4]

[1,2,3]DEPARTMENT OF ANAESTHESIOLOGY, SAVEETHA MEDICAL COLLEGE AND HOSPITALS, SAVEETHA INSTITUTE OF MEDICAL AND TECHNICAL SCIENCES, SAVEETHA UNIVERSITY, CHENNAI, TAMILNADU, INDIA.

[4]TUTOR, DEPARTMENT OF PROSTHODONTICS AND CROWN & BRIDGE, SREE BALAJI DENTAL COLLEGE & HOSPITAL, CHENNAI, INDIA

Abstract

An 81-year-old female with severe aor6c stenosis, moderate mitral stenosis, type 2 diabetes mellitus, hypertension, and hypothyroidism presented with acute onset dyspnoea and was diagnosed with mul6valvular heart disease complicated by cardiogenic pulmonary oedema. Given her high surgical risk, she underwent transfemoral transcatheter aor6c valve replacement (TAVR) combined with percutaneous coronary interven6on (PCI) under general anesthesia. Anesthe6c management was tailored to maintain hemodynamic stability, employing 6trated induc6on, invasive monitoring, temporary pacing, and proac6ve vasopressor support. The procedure was unevenIul, and the pa6ent was extubated on postopera6ve day one. Echocardiography confirmed op6mal prosthe6c valve func6on, and she was discharged with stable hemodynamics. This case underscores the feasibility of concomitant PCI and TAVR in an octogenarian with complex comorbidi6es when supported by me6culous anesthe6c planning, vigilant intraopera6ve monitoring, and a mul6disciplinary approach, achieving favorable outcomes despite extreme procedural risk.

Keywords:

Transcatheter aor6c valve replacement, Percutaneous coronary interven6on, General anesthesia, Aor6c stenosis, Elderly, Mul6valvular heart disease.

INTRODUCTION

Aor6c stenosis (AS) is the most prevalent valvular heart disease in older adults, predominantly resul6ng from progressive degenera6ve calcifica6on. Its incidence rises markedly with age, affec6ng approximately 2–4 % of individuals over 75 years of age [1]. Without interven6on, symptoma6c severe AS in elderly pa6ents carries a poor prognosis, with two-year mortality approaching 50 % [2].

Surgical aor6c valve replacement (SAVR) has tradi6onally been the standard of care; however, agerelated comorbidi6es, frailty, and diminished physiological reserves oZen render high-risk elderly pa6ents unsuitable for open-heart surgery [3]. Over the past two decades, transcatheter aor6c valve replacement (TAVR) has emerged as a minimally invasive and effec6ve alterna6ve. Mul6ple landmark trials have demonstrated TAVR to be non-inferior—and in certain cohorts, superior—to SAVR in terms of survival and func6onal improvement among intermediate- and high-risk pa6ents [3,4]. Interna6onal guidelines now recommend TAVR for pa6ents aged ≥75 years or those at elevated surgical risk [3].

From an anaesthe6c perspec6ve, TAVR poses dis6nct challenges. While monitored anaesthesia care or conscious seda6on is increasingly favoured for procedural efficiency and avoidance of general anaesthesia, there remains a risk of urgent conversion to general anaesthesia due to complica6ons, necessita6ng the presence of an experienced cardiac anaesthesiologist [1,2]. Induc6on in elderly pa6ents with severe AS requires me6culous haemodynamic control, as rapid changes in preload, aZerload, or heart rate can precipitate instability. Novel agents such as remimazolam have shown promise, with studies indica6ng less hypotension compared to propofol during

induc6on in high-risk elderly pa6ents [5]. Addi6onally, peri-TAVR strategies, including prophylac6c vasopressor infusions (e.g., noradrenaline), have been found effec6ve in preven6ng anaesthesia-induced hypotension during induc6on [6].

The periopera6ve period is further complicated by the presence of mul6ple comorbidi6es frequently seen in octogenarians, such as coronary artery disease, diabetes mellitus, hypertension, and chronic pulmonary or renal dysfunc6on. These factors necessitate a mul6disciplinary approach involving cardiologists, anaesthesiologists, intensivists, and nursing teams to op6mise preopera6ve status, maintain intraopera6ve stability, and ensure vigilant postopera6ve monitoring [1,4].

In this case report, we describe the anaesthe6c management of an 81-year-old female with severe AS, mul6valvular heart disease, and mul6ple systemic comorbidi6es who underwent TAVR in conjunc6on with percutaneous coronary interven6on (PCI). We detail the preopera6ve op6misa6on, anaesthe6c strategy, intraopera6ve monitoring, haemodynamic management, and postopera6ve course, highligh6ng how tailored anaesthe6c planning and mul6disciplinary coordina6on contributed to a successful outcome in a high-risk elderly pa6ent.

Case Presentation

An 81-year-old female presented to the emergency department with acute onset dyspnoea (New York Heart Associa6on Class IV) for two days, associated with profuse swea6ng. She denied chest pain, palpita6ons, fever, vomi6ng, or abdominal discomfort. Her medical history was significant for mul6valvular heart disease, type 2 diabetes mellitus, systemic hypertension, and hypothyroidism, for which she was on oral metoprolol, telmisartan, and thyroxine supplementa6on.

On admission, she was diagnosed with severe aor6c stenosis (AS) and moderate mitral stenosis (MS), complicated by cardiogenic pulmonary oedema. Electrocardiography revealed normal sinus rhythm with leZ ventricular hypertrophy. Transthoracic echocardiography demonstrated a leZ ventricular ejec6on frac6on of 58% with adequate systolic func6on, calcified aor6c valve with severe stenosis (peak gradient: 65 mmHg, mean gradient: 42 mmHg), mild aor6c regurgita6on, calcified mitral valve with mild MS (peak gradient: 15 mmHg, mean gradient: 6 mmHg), mild mitral regurgita6on, and trivial tricuspid regurgita6on.

The pa6ent underwent op6misa6on with an6platelets, an6coagulants, and an6-ischaemic therapy before the procedure. Given her advanced age, severe valvular pathology, and comorbidi6es, a mul6disciplinary team decided to proceed with transfemoral transcatheter aor6c valve replacement (TAVR) combined with percutaneous coronary interven6on (PCI) under general anaesthesia.

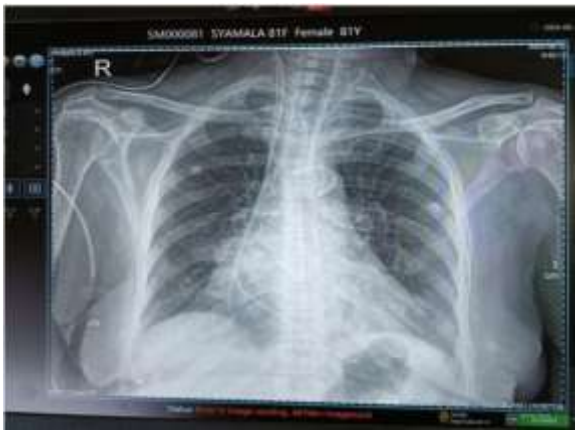
In the opera6ng room, standard ASA monitoring was supplemented with invasive arterial pressure monitoring and central venous access. Preoxygena6on was followed by intravenous administra6on of midazolam 2 mg, fentanyl 200 µg, and propofol 60 mg for induc6on. Neuromuscular relaxa6on was avoided during intuba6on to maintain haemodynamic stability, and the pa6ent was intubated with a

7.0 mm endotracheal tube. A temporary transvenous pacemaker was inserted via the central line sheath, and external defibrillator pads were placed in an6cipa6on of arrhythmias.

Anaesthesia was maintained with an atracurium infusion at 20 mg/hr and a fentanyl infusion at 50 µg/hr. Intraopera6vely, heart rate was maintained around 88 beats/min and oxygen satura6on at 100%. Blood pressure, ini6ally stable at 150/90 mmHg, dropped during valve deployment, necessita6ng ini6a6on of a noradrenaline infusion. Total intraopera6ve fluid input was 250 mL, urine output was 200 mL, and es6mated blood loss was approximately 100 mL. The procedure was unevenIul, and the pa6ent was transferred to the intensive care unit (ICU) for elec6ve postopera6ve ven6la6on.

She was extubated the following day, and the temporary pacemaker was removed. Postopera6vely, she was con6nued on dual an6platelet therapy and an6coagula6on. Holter monitoring revealed occasional short runs of sinus tachycardia without significant arrhythmia. A repeat echocardiogram showed a well-seated prosthe6c aor6c valve with a mean gradient of 15 mmHg, peak gradient of 24 mmHg, and preserved leZ ventricular systolic func6on (EF 58%).

The pa6ent recovered without major complica6ons and was discharged with stable haemodynamics and instruc6ons for follow-up with cardiology and cardiac anaesthesia teams.



DISCUSSION

The periopera6ve anesthe6c management of an octogenarian undergoing concomitant transcatheter aor6c valve replacement (TAVR) and percutaneous coronary interven6on (PCI) is inherently complex. Such cases demand a me6culous approach to hemodynamic stability, procedural planning, and mul6disciplinary coordina6on, especially when compounded by severe mul6valvular pathology and systemic comorbidi6es.

At 81 years old, our pa6ent was at the upper extreme of surgical risk. Severe aor6c stenosis (AS) alone is associated with high periopera6ve morbidity and mortality if untreated, with a reported two-year mortality approaching 50% in symptoma6c elderly pa6ents [1]. In this case, the burden was amplified by moderate mitral stenosis (MS), type 2 diabetes mellitus, systemic hypertension, and hypothyroidism.

Frailty, diminished physiological reserves, and polypharmacy complicate anesthe6c management in octogenarians [2]. Age-related changes—such as reduced ventricular compliance, blunted betaadrenergic responsiveness, and decreased renal clearance—render this popula6on more vulnerable to hypotension, arrhythmia, and postopera6ve complica6ons [3].

CAD is present in up to 75% of elderly pa6ents with severe AS [4]. The management strategy for significant CAD in the seqng of TAVR remains debated. While staged PCI prior to TAVR is common, performing both procedures in a single siqng can reduce the cumula6ve risk of repeated anesthesia exposure and hospital admission [5]. However, concomitant interven6on raises concerns over bleeding risk from dual an6platelet therapy, prolonged procedural 6me, and addi6ve hemodynamic stress [6]. In our case, the team elected for a combined approach, recognizing the pa6ent's fragility and aiming to minimize repeated interven6ons. This required careful

perioperative anticoagulation management and readiness to address ischemic or bleeding complications immediately.

For transfemoral TAVR, monitored anesthesia care (MAC) or conscious sedation is increasingly preferred over general anesthesia (GA), with studies showing shorter recovery times, reduced vasopressor use, and lower rates of postoperative delirium [7,8]. Nevertheless, GA remains the anesthetic of choice for patients with anticipated airway challenges, high procedural complexity, or concurrent cardiac interventions [9].

In our patient, GA was deemed optimal due to:

- The dual nature of the procedure (TAVR + PCI)
- Need for complete immobility
- Potential for hemodynamic instability from multivalvular disease
- Anticipated requirement for immediate airway control if complications arose

This choice aligns with recommendations from Afshar et al., who emphasize GA's role in high-risk and technically demanding TAVR cases [10].

In severe AS, maintenance of sinus rhythm, preload, and afterload is paramount. Hypotension can critically reduce coronary perfusion and precipitate ischemia. Induction of anesthesia is particularly hazardous, as loss of sympathetic tone from anesthetic agents can cause precipitous blood pressure drops [11].

To mitigate these risks, we employed a series of deliberate strategies aimed at maintaining hemodynamic stability and ensuring readiness for rapid intervention. Induction was carried out using a carefully titrated regimen of midazolam, fentanyl, and propofol to minimize cardiovascular depression. Neuromuscular blockade was intentionally avoided during intubation to reduce the potential for myocardial depression and abrupt changes in systemic vascular resistance. Continuous beat-to-beat monitoring was facilitated by the insertion of invasive arterial and central venous lines, allowing precise hemodynamic assessment throughout the procedure. A temporary transvenous pacemaker was positioned to provide immediate pacing support in the event of bradyarrhythmias or high-grade atrioventricular block, while external defibrillation pads were kept in situ to enable prompt electrical intervention should malignant arrhythmias occur. This comprehensive and proactive approach allowed the anesthetic team to anticipate and effectively manage potential intraoperative challenges in this high-risk patient.

Noradrenaline infusion was initiated promptly upon intraoperative hypotension, consistent with recent randomized data demonstrating its efficacy in preventing anesthesia-induced hypotension during TAVR [12]. Such proactive management likely contributed to the patient's hemodynamic stability.

Success in this case hinged on seamless coordination between cardiology, cardiac anesthesiology, and interventional cardiology teams. The preoperative period focused on optimizing the patient's cardiovascular status, adjusting antihypertensive and antiplatelet medications, and planning for immediate postoperative intensive care. This collaborative model is endorsed by recent consensus guidelines as essential for improving TAVR outcomes in high-risk elderly patients [13].

Postoperatively, the patient remained intubated for elective overnight ventilation to ensure hemodynamic stability and avoid fatigue-related complications. She was extubated successfully the following morning and transferred from ICU once stable. Holter monitoring revealed only short runs of sinus tachycardia, and echocardiography demonstrated well-functioning prosthetic valve leaflets with acceptable gradients. Elderly TAVR recipients typically exhibit early improvements in functional status and symptom burden, with preserved quality of life for at least one year post-procedure [14]. Our patient's recovery trajectory was consistent with these findings, with no in-hospital complications.

The uniqueness of this case lies in a combination of clinical complexity, procedural strategy, and outcome. First, the patient presented with severe multivalvular disease—severe aortic stenosis accompanied by moderate mitral stenosis—which is uncommon among TAVR candidates and necessitated meticulous management of preload and afterload to avoid hemodynamic compromise. Second, the decision to perform percutaneous coronary intervention (PCI) and TAVR in a single procedural session in an octogenarian with multiple systemic comorbidities represents a high-risk yet efficient therapeutic approach, rarely described in the literature. Third, the anesthetic plan reflected deliberate individualization; general anesthesia (GA) was chosen over the increasingly common monitored

anesthesia care (MAC) approach due to procedural complexity, the presence of significant comorbidi6es, and the need for maximal airway and hemodynamic control. Fourth, the use of proac6ve monitoring—including invasive arterial and central venous access, temporary pacing, and pre-applied external defibrilla6on—ensured immediate readiness to address poten6al intraopera6ve complica6ons. Finally, despite the pa6ent's extreme risk profile, the postopera6ve course was smooth, underscoring the cri6cal role of comprehensive preopera6ve prepara6on, vigilant intraopera6ve management, and coordinated mul6disciplinary care in delivering excellent outcomes in highly vulnerable pa6ents.

This case highlights several important clinical implica6ons for the management of high-risk elderly pa6ents undergoing complex cardiac interven6ons. First, anesthe6c choice must be individualized; while monitored anesthesia care (MAC) is generally safe and advantageous for straighIorward TAVR cases, general anesthesia (GA) remains the preferred op6on for complex or combined procedures where airway security, absolute immobility, and 6ght hemodynamic control are cri6cal. Second, comprehensive monitoring is essen6al in severe aor6c stenosis, par6cularly in elderly pa6ents with concomitant valvular disease, to enable prompt detec6on and correc6on of hemodynamic instability. Third, mul6disciplinary planning—integra6ng the exper6se of cardiology, cardiac anesthesiology, interven6onal cardiology, and cri6cal care—op6mizes outcomes by ensuring that hemodynamic, procedural, and postopera6ve challenges are an6cipated and effec6vely addressed. Finally, while concomitant PCI and TAVR can be performed safely in carefully selected elderly pa6ents, success hinges on me6culous periopera6ve management of an6coagula6on, minimiza6on of procedural 6me, and vigilance in mi6ga6ng bleeding risk.

CONCLUSION

This case illustrates that with me6culous periopera6ve planning, a tailored anesthe6c approach, and vigilant intraopera6ve and postopera6ve management, even the most vulnerable octogenarians with severe aor6c stenosis, mul6valvular involvement, and mul6ple comorbidi6es can successfully undergo complex interven6ons like TAVR with concurrent PCI. Its success highlights the importance of selec6ng appropriate anesthesia, integra6ng invasive monitoring, rapid hemodynamic interven6on, and strong interprofessional teamwork—themes increasingly recognized but rarely detailed in current literature.

REFERENCES

1. Moss RR, Iung B, Piazza N, Adams DH, Baldus S, Holzhey D, et al. Systema6c review and metaanalysis of transcatheter aor6c valve implanta6on versus surgical aor6c valve replacement in high surgical risk pa6ents. *J Am Coll Cardiol*. 2020;75(20):2431-42. doi:10.1016/ j.jacc.2020.03.018. PMID: 32425705; PMCID: PMC7525883.

2. Afilalo J, Lauck S, Kim DH, Lefèvre T, Piazza N, Lachapelle K, et al. Frailty in older adults undergoing aor6c valve replacement: the FRAILTY-AVR study. *J Am Coll Cardiol*. 2017;70(6):689-700. doi:10.1016/j.jacc.2017.06.024. PMID: 28774696.

3. Forman DE, Alexander KP. Frailty: a vital sign for older adults with cardiovascular disease. *Can J Cardiol*. 2016;32(9):1082-7. doi:10.1016/j.cjca.2016.03.019. PMID: 27324197.

4. Goel SS, Ige M, Tuzcu EM, Ellis SG, Stewart WJ, Svensson LG, et al. Severe aor6c stenosis and coronary artery disease—implica6ons for management in the transcatheter aor6c valve replacement era. *J Am Coll Cardiol*. 2013;62(1):1-10. doi:10.1016/j.jacc.2013.01.096. PMID: 23644094.

5. Barban6 M, Webb JG, Hahn RT, Feldman T, Boone RH, Smith CR, et al. Impact of preopera6ve or concomitant percutaneous coronary interven6on on outcomes aZer transcatheter aor6c valve replacement. *EuroInterven3on*. 2014;10(6):e1-8. doi:10.4244/EIJV10I6A108. PMID: 24891362.

6. Witberg G, Lavi I, Harari E, Assali A, Vaknin-Assa H, Orvin K, et al. Concomitant percutaneous coronary interven6on and transcatheter aor6c valve replacement: a mul6center registry. *J Am Heart Assoc*. 2021;10(3):e018584. doi:10.1161/JAHA.120.018584. PMID: 33430624.

7. Mayr NP, Michel J, Bleiziffer S, Tassani-Prell P, Mar6n K, Wagenpfeil S, et al. Seda6on or general anesthesia for transcatheter aor6c valve implanta6on (TAVI). *J Thorac Dis*. 2015;7(10):1518-26. doi:10.3978/j.issn.2072-1439.2015.10.29. PMID: 26693149; PMCID: PMC4598507.

8. Hyman MC, Vemulapalli S, Szeto WY, Stebbins A, Patel PA, Matsouaka R, et al. Conscious seda6on versus general anesthesia for transcatheter aor6c valve replacement: insights from the NCDR STS/ACC TVT registry. *Circula3on*. 2017;136(22):2132-40. doi:10.1161/CIRCULATIONAHA.117.029362. PMID: 29138262.

9. Owo CM, Nishimura RA, Bonow RO, Carabello BA, Erwin JP 3rd, Gen6le F, et al. 2020 ACC/AHA guideline for the management of pa6ents with valvular heart disease. *J Am Coll Cardiol*. 2021;77(4):450-500. doi:10.1016/j.jacc.2020.11.035. PMID: 33342587.

10. Afshar AH, Kahlon A, Sadiq A, Malas J, Raza S, Hameed I, et al. Periprocedural considera6ons of transcatheter aor6c valve replacement for anesthesiologists. *Anesth Essays Res*. 2016;10(3):393-400. doi:10.4103/0259-1162.176403. PMID: 27746571; PMCID: PMC4970570.

11. Nishimura RA, Owo CM, Bonow RO, Carabello BA, Erwin JP 3rd, Fleisher LA, et al. 2017 AHA/ACC focused update on valvular heart disease guidelines. *Circula3on*. 2017;135(25):e1159-e1195. doi:10.1161/CIR.0000000000000503. PMID: 28298458.

12. Onishi K, Minami K, Kanmura Y. Noradrenaline infusion prevents anesthesia-induced hypotension during induc6on in pa6ents undergoing transcatheter aor6c valve replacement: a randomized controlled trial. *J Cardiothorac Vasc Anesth*. 2024;38(5):1375-82. doi:10.1053/j.jvca.2024.01.023. PMID: 38317434; PMCID: PMC11176125.

13. Leon MB, Smith CR, Mack MJ, Makkar RR, Svensson LG, Kodali SK, et al. Transcatheter or surgical aor6c-valve replacement in intermediate-risk pa6ents. *N Engl J Med*. 2016;374(17):1609-20. doi:10.1056/NEJMoa1514616. PMID: 27040324.

14. Kim JH, Ahn JM, Kang DY, Song H, Koo BK, Kang SJ, et al. Comparison of outcomes aZer transcatheter aor6c valve replacement between octogenarians and non-octogenarians. *Medicine (Bal3more)*. 2022;101(27):e29664. doi:10.1097/MD.0000000000029664. PMID: 35793958; PMCID: PMC9285489.