

The Outcome of Cardiogenic Shock After TAVI: Risks and Preventions

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Abstract:

Background: Cardiogenic shock complicating severe aortic stenosis (AS) represents one of the most hemodynamically precarious presentations encountered in interventional cardiology. Transcatheter aortic valve implantation (TAVI) has emerged as a viable rescue strategy in this high-risk setting, yet the evidence base guiding its use remains limited due to the historical exclusion of hemodynamically unstable patients from major clinical trials.

Objective: To examine the clinical outcomes of cardiogenic shock occurring in the context of severe AS managed with emergent TAVI, and to discuss associated risk factors and preventive strategies.

Case Summary: An 89-year-old woman with diabetes and prior stroke presented with syncope and suffered in-hospital cardiac arrest due to asystole. Following resuscitation, severe AS was confirmed echocardiographically. She was transferred for TAVI evaluation but rapidly deteriorated into cardiogenic shock, manifesting as severe hypotension and diffuse ST-segment depression. Emergent coronary angiography excluded obstructive coronary artery disease. Intra-aortic balloon pump (IABP) support and inotropic therapy were initiated, followed by emergent transfemoral TAVI. The procedure was uncomplicated, hemodynamic support was weaned within 72 hours, and the patient was discharged home on day 26. At one-year follow-up, she remained ambulatory with a well-functioning prosthetic valve.

Conclusion: Favorable outcomes in cardiogenic shock complicating severe AS are achievable with prompt emergent TAVI combined with mechanical circulatory support. Identification of risk factors predisposing to acute AS decompensation remains a critical unmet need.

Key words: aortic stenosis; cardiogenic shock; transcatheter aortic valve implantation; intra-aortic balloon pump; mechanical circulatory support

Introduction

Transcatheter aortic valve implantation has fundamentally transformed the management of severe symptomatic AS. Originally developed for patients deemed inoperable or at prohibitively high surgical risk, TAVI indications have progressively expanded to encompass intermediate- and low-risk surgical candidates, supported by landmark randomized trials [1–7]. Despite this evolution, one population has remained consistently underrepresented in the pivotal trial literature: patients presenting with hemodynamic instability requiring inotropic or mechanical circulatory support at the time of the procedure [2–7].

Cardiogenic shock complicating acute decompensation of severe AS is a life-threatening emergency associated with high short- and medium-term mortality. Data from the United States national TAVI registry indicate that approximately 4.1% of TAVI procedures are performed in the setting of preceding cardiogenic shock, carrying a 30-day mortality of 19.1% [8]. Longer-term outcomes are similarly sobering, with 1-year mortality

reaching 25.7% and heart failure readmission rates of 8.6% [9]. These figures underscore the severity of the condition and the urgency with which effective management strategies must be developed.

This article reviews the clinical outcomes, procedural risks, and preventive strategies relevant to cardiogenic shock in the TAVI context, drawing on both published registry data and a clinically instructive case.

Case Presentation

Initial Presentation

The patient was an 89-year-old woman with a medical history significant for type 2 diabetes mellitus and prior cerebrovascular accident. She presented to an outside emergency department following a syncopal episode. While under observation, she experienced sudden loss of consciousness with cardiac monitor demonstrating asystole. Cardiopulmonary resuscitation was promptly initiated with successful return of spontaneous circulation.

Post-resuscitation transthoracic echocardiography revealed severe AS with a peak gradient of 85 mmHg and a mean gradient of 50 mmHg. Given the need for advanced structural heart disease management including TAVI, she was transferred to a tertiary center with a dedicated heart valve program.

In-Hospital Deterioration and Diagnosis of Cardiogenic Shock

Following admission to the receiving center, the patient initially remained hemodynamically stable. However, during repeat transthoracic echocardiography, she suddenly developed acute confusion. Systolic blood pressure fell to the 60s mmHg, and a 12-lead electrocardiogram demonstrated diffuse ST-segment depression across multiple leads. These findings prompted emergent cardiac catheterization.

Coronary angiography demonstrated no significant epicardial coronary artery stenosis, effectively excluding acute coronary syndrome as the precipitant. Echocardiography concurrently revealed severe mitral regurgitation with preserved left ventricular ejection fraction, consistent with functional mitral regurgitation secondary to acute hemodynamic derangement from severe AS. The clinical picture was consistent with cardiogenic shock attributable to acute decompensation of severe AS.

Her calculated surgical risk scores were markedly elevated: Society of Thoracic Surgeons (STS) predicted risk of mortality 43.7%, EuroSCORE II 14%, and JapanSCORE 34.6%, confirming that emergent surgical aortic valve replacement carried unacceptable risk. The multidisciplinary heart team reached consensus in favor of emergent TAVI.

Emergent TAVI Procedure

Hemodynamic stabilization was achieved with IABP insertion and intravenous inotropic therapy. Enhanced CT imaging was obtained immediately following coronary angiography to facilitate procedural planning.

Based on CT-derived annular measurements, a 23 mm Evolut PRO self-expandable bioprosthesis (Medtronic, Minneapolis, MN, USA) was selected. The choice of a self-expandable system was deliberate: it allowed valve deployment without rapid right ventricular pacing, a critical consideration in a hemodynamically unstable patient.

Pre-dilatation balloon aortic valvuloplasty was performed using a 20 mm Inoue balloon without rapid pacing. Coronary heights measured 14.6 mm for the right coronary ostium and 12.8 mm for the left, raising concern for potential left coronary artery occlusion during valve expansion. Accordingly, a 6 French Judkins left guiding catheter was engaged in the left coronary artery with a workhorse wire positioned in the left anterior descending artery for coronary protection throughout valve deployment. Following complete expansion of the Evolut PRO, coronary angiography confirmed unobstructed bilateral coronary flow. The guiding catheter was then carefully withdrawn without disturbing the implanted prosthesis. Post-deployment hemodynamic assessment demonstrated significant improvement in the transvalvular pressure gradient.

Post-Procedural Course and Follow-Up

The IABP was successfully weaned on post-operative day 2, and inotropic support was discontinued on day 3. The patient underwent inpatient cardiac rehabilitation and was discharged home on day 26.

At one-year follow-up, the patient was functionally independent and ambulatory. Echocardiography demonstrated a normally functioning transcatheter aortic valve prosthesis with only mild paravalvular and mitral regurgitation, representing a marked improvement from her presentation.

Discussion

Epidemiology and Prognosis of Cardiogenic Shock in the TAVI Setting

Cardiogenic shock preceding TAVI is encountered in approximately 4% of cases in large national registries [8]. These patients represent the extreme end of the risk spectrum, carrying substantially elevated 30-day and 1-year mortality compared to elective TAVI recipients. Importantly, however, landmark analyses suggest that patients who survive the initial 30-day period face a subsequent mortality trajectory comparable to that of electively treated patients [10]. This observation provides important prognostic context: the defining challenge is navigating the acute phase, not the long-term course.

The most common causes of death following emergent TAVI in cardiogenic shock are multi-organ failure and sepsis [10]. This underscores that procedural success alone is insufficient; sustained hemodynamic support to preserve end-organ perfusion, combined with rigorous infection prevention, are equally critical determinants of survival.

Risk Factors for Acute Decompensation

Several factors may predispose patients with severe AS to acute hemodynamic decompensation and cardiogenic shock:

- **Advanced age and frailty:** Elderly patients, as illustrated in this case, have diminished physiological reserve and are more vulnerable to precipitous hemodynamic collapse.
- **Concomitant valvular disease:** Severe mitral regurgitation, as seen here, compounds the hemodynamic burden imposed by AS by reducing forward cardiac output, creating a vicious cycle of pressure overload and mitral annular dilatation.
- **Preserved ejection fraction with diastolic dysfunction:** Paradoxically, patients with preserved systolic function may be at heightened risk for acute decompensation due to impaired diastolic filling and dependence on adequate preload, rendering them vulnerable to any acute stressor.
- **Delayed diagnosis:** AS may progress insidiously and remain unrecognized until severe hemodynamic compromise occurs.
- **Triggering events:** Arrhythmias, acute illness, dehydration, or physiological stress may unmask latent hemodynamic instability in patients with critical valve obstruction.

The Role of Mechanical Circulatory Support

Intra-aortic balloon pump counterpulsation provides modest but clinically meaningful hemodynamic benefit in the setting of cardiogenic shock: it reduces afterload during systole and augments diastolic aortic pressure, thereby improving coronary perfusion pressure. In TAVI for cardiogenic shock, IABP serves as a bridge to the procedure and supports end-organ perfusion during and immediately after valve implantation.

For patients with more profound hemodynamic compromise or cardiac arrest, extracorporeal membrane oxygenation (ECMO) provides more complete circulatory support. The present case did not require ECMO, as the patient had not suffered cardiopulmonary arrest at the time of TAVI. The selection of mechanical circulatory support should be individualized based on the severity and reversibility of shock, available institutional expertise, and the anticipated duration of support required.

Procedural Considerations and Risk Mitigation

Several technical strategies can mitigate procedural risk in emergent TAVI for cardiogenic shock:

- Valve selection: Self-expandable prostheses permit deployment without rapid ventricular pacing, reducing the risk of additional hemodynamic insult during implantation.
- Coronary protection: When coronary occlusion risk is elevated — as determined by low coronary ostial height or large native leaflet area — prophylactic coronary wire placement or even pre-wiring with a balloon should be considered.
- Imaging: While CT remains the gold standard for pre-TAVI anatomical assessment, three-dimensional echocardiography has demonstrated strong correlations with CT-derived annular measurements [11] and may offer advantages in patients where contrast exposure is undesirable.
- Anesthesia: Both general and local anesthesia with conscious sedation are acceptable strategies, with randomized trial data supporting equivalent outcomes [12]. In hemodynamically unstable patients, the anesthetic approach should be guided by the clinical situation and anesthesiologist expertise.
- Multidisciplinary coordination: Rapid mobilization of a heart team — including interventional cardiologists, cardiac surgeons, anesthesiologists, and cardiac imaging specialists — is essential to minimize door-to-treatment time.

Prevention Strategies

Prevention of cardiogenic shock in AS patients begins with timely identification and treatment of severe AS before decompensation occurs. Key preventive measures include:

1. Early echocardiographic surveillance in patients with known or suspected AS, particularly those with symptoms of syncope, dyspnea, or angina.
2. Prompt referral to a valve center when severe AS is confirmed, avoiding unnecessary delays that increase the risk of acute deterioration.
3. Heart team evaluation prior to elective procedures to identify patients at imminent risk of decompensation who may benefit from expedited rather than routine scheduling.
4. Avoidance of precipitants in hospitalized AS patients, including volume depletion, tachyarrhythmias, and non-cardiac procedures that impose physiological stress.
5. Pre-procedural optimization with careful fluid management and, where appropriate, bridge therapy with balloon aortic valvuloplasty in patients who cannot undergo definitive valve replacement immediately.

Conclusion

Cardiogenic shock complicating severe aortic stenosis is a high-mortality emergency that demands rapid, coordinated intervention. Emergent TAVI combined with mechanical circulatory support — most commonly IABP, and ECMO when indicated — represents a feasible and potentially life-saving strategy. Patients who survive the critical early post-procedural

period can achieve long-term outcomes approaching those of elective TAVI. Key risk mitigation strategies include appropriate valve and device selection, coronary protection when anatomically indicated, and aggressive hemodynamic and infectious management post-procedure. Prospective registries and dedicated trials are urgently needed to better define risk factors for acute AS decompensation and to optimize patient selection and procedural technique in this vulnerable population.

The authors declare no conflicts of interest relevant to this article.

References

1. Otto CM, Nishimura RA, Bonow RO, et al. (2020), ACC/AHA Guideline for the management of patients with valvular heart disease: executive summary. *J Am Coll Cardiol.* ;77:450–500.
2. Mack MJ, Leon MB, Thourani VH, et al. (2019), Transcatheter aortic-valve replacement with a balloon-expandable valve in low-risk patients. *N Engl J Med.* ;380:1695–1705.
3. Popma JJ, Deeb GM, Yakubov SJ, et al. (2019), Transcatheter aortic-valve replacement with a self-expanding valve in low-risk patients. *N Engl J Med.* ;380:1706–1715.
4. Leon MB, Smith CR, Mack MJ, et al. (2016), Transcatheter or surgical aortic-valve replacement in intermediate-risk patients. *N Engl J Med.* ;374:1609–1620.
5. Reardon MJ, Van Mieghem NM, Popma JJ, et al. (2017), Surgical or transcatheter aortic-valve replacement in intermediate-risk patients. *N Engl J Med.* 376:1321–1331.
6. Adams DH, Popma JJ, Reardon MJ, et al. (2014), Transcatheter aortic-valve replacement with a self-expanding prosthesis. *N Engl J Med.* ;370:1790–1798.
7. Makkar RR, Fontana GP, Jilaihawi H, et al. (2012), Transcatheter aortic-valve replacement for inoperable severe aortic stenosis. *N Engl J Med.* ;366:1696–1704.
8. Masha L, Vemulapalli S, Manandhar P, et al. (2020), Demographics, procedural characteristics, and clinical outcomes when cardiogenic shock precedes TAVR in the United States. *JACC Cardiovasc Interv.* ;13:1314–1325.
9. Fraccaro C, Campante Teles R, Tchéché D, et al. (2020), Transcatheter aortic valve implantation (TAVI) in cardiogenic shock: TAVI-shock registry results. *Catheter Cardiovasc Interv.* ;96:1128–1135.
10. Frerker C, Schewel J, Schlüter M, et al. (2016), Emergency transcatheter aortic valve replacement in patients with cardiogenic shock due to acutely decompensated aortic stenosis. *EuroIntervention.* ;11:1530–1536.
11. Rong LQ, Hameed I, Salemi A, et al. (2019), Three-dimensional echocardiography for transcatheter aortic valve replacement sizing: a systematic review and meta-analysis. *J Am Heart Assoc.* ;8:e013463.
12. Thiele H, Kurz T, Feistritzer HJ, et al. (2020), General versus local anesthesia with conscious sedation in transcatheter aortic valve implantation: the randomized SOLVE-TAVI trial. *Circulation.* ;142:1437–1447.



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