Emergency TAVI in a critically ill patient: A case report

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Abstract
Transcatheter aortic valve implantation is a safe procedure even in inoperable patients with multi-organ failure and cardiogenic shock. In such cases, the heart team should be prepared to proceed to emergent implantation for timely and successful management of the patient.

KEYWORDS
aortic stenosis, cardiogenic shock, case report, multi-organ failure, TAVI

1 INTRODUCTION
Transcatheter aortic valve implantation (TAVI) is considered a safe method for treating aortic stenosis (AS). However, AS complicated with cardiogenic shock results in high rates of mortality. We present here a patient with AS complicated by cardiogenic shock and multiple organ failure who was treated successfully with an emergent TAVI.

Transcatheter aortic valve implantation (TAVI) was initially introduced for treating inoperable or high surgical risk patients.1 However, over the last few years, the indications for TAVI have expanded, and currently, there are trials that have proven superiority of this method over surgical aortic valve replacement even in low-risk aortic stenosis (AS) patients.2,3 In all TAVI studies, the procedure was performed electively and a consistent exclusion criterion has been cardiogenic shock manifested by low cardiac output, vasopresor dependence, or mechanical hemodynamic support due to the associated high risks and uncertain outcomes.4 In this case, we present a patient with critical aortic stenosis treated emergently with TAVI in the presence of cardiogenic shock and multi-organ failure.

2 CASE REPORT
A 73-year-old male patient was admitted to our hospital with progressive heart failure. He was diagnosed with severe AS 3 years ago (Figure 1A) and has been suffering from exertional dyspnea and typical angina since then. He was suggested a transcatheter aortic valve replacement (TAVI) at the time of diagnosis, albeit due to his previous history of renal cell carcinoma with multiple various operations, he refused any operation.

On admission, transthoracic echocardiographic evaluation revealed severely impaired left ventricular (LV) systolic function (EF = 30%, GLS = −5%), with spherical remodeling and low flow/low gradient severe aortic stenosis (AVmax = 3.3 m/sec, PeakPG = 43 mmHg, SVI = 25mL/m2; Figure 1B). As previously reported coronary angiogram did not reveal any stenosis, LV impairment and remodeling (Figure 1C) was attributed to the critical aortic stenosis, and TAVI was suggested as being inevitable and urgent. An elective procedure was planned but the patient's condition dramatically worsened, developing cardiogenic shock (BNP 4544 pg/mL), ischemic hepatitis (AST 4484 U/L, ALT 2688 U/L), acute renal failure...
Severe aortic stenosis demands immediate treatment when symptoms occur (syncope, angina, and heart failure). Otherwise, it leads to cardiogenic shock, multi-organ failure, and death.4,5

DrCribier implanted the first transcatheter aortic valve in 2002 in an inoperable patient as an emergency.1 Since then, this method has proven its value in treating aortic stenosis, even in intermediate and low surgical risk patients. There are few reports in literature with patients in cardiogenic shock that have successfully been treated with TAVI,5–8 with high rates of mortality. The overall 30-day mortality for TAVI is reported at 2.27% but when the patient develops cardiogenic shock, the mortality rises to 19%.5 Cardiogenic shock also affects prognosis after TAVI, reducing 1-year survival from 83% to 46% in the cardiogenic group. Patients with cardiogenic shock complicated with multi-organ failure carry an extremely high risk of death and are difficult to manage. Palliative balloon valvuloplasty in these patients is frequently insufficient to reverse the course.

The window of opportunity to intervene with TAVI and break the cycle of hypoperfusion and multi-organ failure is narrow, and emergent intervention is the key to success. From a technical and procedural standpoint, emergency TAVI patients require mechanical ventilation, may show vasoconstriction of access vessels (due to vasopressors), and may not tolerate fast ventricular pacing runs that well (high risk for ventricular fibrillation, need for cardioversion, and stunning of left ventricle). Predilatation should be performed judiciously and always with the transcatheter valve ready for implantation. The choice of prosthesis type will depend on expertise and anatomical factors; balloon expandable valves will require runs of fast pacing whereas self-expandable valves may not require pacing to implant but may have increased rates of pacemaker implantation and paravalvular leak. Finally, regarding access route, the transfemoral approach, when feasible, should be the preferred approach. Alternatively, the choice of transcatheral/ transaortic approach might facilitate TAVI with either an

FIGURE 1 A, Extreme calcification of aortic cusps at cardiac CT; B, Doppler evaluation of Low flow/Low gradient severe aortic stenosis; C, Dilated LV with impaired contractility (systolic frame of long-axis view); D, Fluoroscopic view of Evolut-R prosthesis before postdilatation with balloon; E, Fluoroscopic view of Evolut-R prosthesis after balloon dilatation; F, Improved performance of LV at discharge (systolic frame of long-axis view)
intra-aortic balloon pump in place or with femoro-femoral cardiopulmonary bypass support.

In summary, this case highlights the feasibility and effectiveness of emergency TAVR in cardiogenic shock due to decompensated aortic stenosis.

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CONFLICTS OF INTEREST
All authors have nothing to declare.

AUTHORS CONTRIBUTION
KP, AC, and PK: involved in management of the patient and writing of the manuscript. MC: involved in management of the patient and reviewing of the manuscript. OOT: involved in reviewing of the manuscript. KS was senior author of the manuscript and reviewer of the whole submission.

ETHICS STATEMENT
Consent for publication anonymized has been obtained from the patient. As it is a case report, no approval from our ethics committee was required.

DATA AVAILABILITY STATEMENT
All data are available at the electronic file of the patient and the PACS system of our hospital.

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