

## CASO CLÍNICO

# Emergent Surgery After Double Prosthesis Embolization During Transcatheter Aortic Valve Replacement: A Case Report

## *Cirurgia Emergente Após Dupla Embolização de Prótese Durante a Substituição de Válvula Aórtica Percutânea: Caso Clínico*

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### Afiliação

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Anesthesia; Heart Valve Prosthesis/adverse effects; Transcatheter Aortic Valve Replacement

### Palavras-chave

Anestesia; Próteses de Válvulas Cardíacas/efeitos adversos; Substituição Percutânea da Válvula Aórtica

## ABSTRACT

Transcatheter aortic valve replacement is recognized as an effective therapeutic option for elderly patients with severe aortic stenosis with high or extreme risk for surgery. Valve prosthesis embolization and migration are rare complications, but potentially life-threatening. This case presents a perioperative anesthetic management of a double migration and embolization of transcatheter valve. Herein, complications of percutaneous approach and immediate resuscitation by a multidisciplinary Heart Team are discussed.

## RESUMO

A substituição percutânea da válvula aórtica é reconhecida como uma opção terapêutica eficaz para pacientes idosos com estenose aórtica grave e risco elevado ou extremo de cirurgia. A embolização e migração de próteses valvulares são complicações raras, mas potencialmente ameaçadoras de vida. Este caso apresenta a abordagem anestésica perioperatória de uma embolização e migração valvular transcatheter duas vezes durante o procedimento. Neste caso, são discutidas complicações da abordagem percutânea e a ressuscitação imediata por uma equipa multidisciplinar cardíaca.

## INTRODUCTION

Calcific aortic stenosis (AS) remains the most prevalent valvular disease in elderly population, with a prevalence of 10% in the age of 80 years.<sup>1</sup> Transcatheter aortic valve replacement (TAVR), has become an alternative for patients with severe AS who are either at high-risk clinically or non-eligible for conventional surgery. Transfemoral approach to TAVR was associated with a reduced perioperative risk of mortality and stroke for patients older than 65 years, although with higher risks for paravalvular leak, pacemaker requirement and vascular complications.<sup>2</sup>

Valve embolization and migration (TVEM) are uncommon (1%) and were associated with high morbidity and mortality.<sup>3</sup> This paper reports the perioperative anesthetic management of a TAVR complicated with double migration and embolization of the valve, culminating in conventional open-heart surgery. In literature, very few cases report anesthetic considerations regarding this situation.

## CASE REPORT

An 84-year-old male patient with symptomatic severe AS was proposed for elective TAVR. Previous medical history revealed dyslipidemia, overweight and bypass grafting after myocardial infarction (MI) 20 years ago. TAVR was chosen based on the patient's comorbidities, previous sternotomy, and advanced age by the Heart Team.

The procedure was performed in the cardiac catheterization laboratory. A moderate sedation was induced with bolus of droperidol 1.25 mg, fentanyl 0.1 mg and midazolam 1 mg under monitoring with 5-lead ECG, pulse oximetry, invasive blood pressure and heart rate. A 29 mm CoreValve Evolut PRO was positioned by a transfemoral approach. Immediately

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after postimplant balloon dilatation of the bioprosthesis, there was a migration and embolization of the prosthesis to the ascending aorta. A new implantation attempt was performed with a 26 mm Edwards SAPIEN valve, however there was a second migration and embolization into the distal portion of the former prosthesis. During the manipulation of the second valve, it suffered a 90° rotation, becoming perpendicular to the first and causing left ventricular outflow obstruction. The patient became obtunded and severely hypotensive, and noradrenaline was started. Induction of general anesthesia (GA) with orotracheal intubation was performed using fentanyl 0.1 mg, midazolam 5 mg and rocuronium 50 mg. Afterwards, a central venous catheter was placed for continuous administration of noradrenaline.

Hemodynamic stabilization was obtained with vasopressor support and pacemaker rhythm around 15 minutes later and the patient was transferred to the cardiac operating room (OR) for emergent removal of prosthesis. Neurologic monitoring with bispectral index and *in vivo* optical spectroscopy (INVOS) was added and no significantly decreased regional oxygen saturation was observed. Intraoperative maximum lactate level was 3.3 mmol/L. Maintenance of GA was assured with infusion of propofol, remifentanyl and bolus of rocuronium. The surgical procedure involved removal of the two prostheses and Sutureless Perceval XL aortic valve implantation (Figs.1 and 2). In the postoperative period, the patient was admitted in the cardiothoracic intensive care unit (ICU) with inotropic support of dobutamine 5 ug/kg/min and pacemaker dependence.

On 1-day postoperatively, sedation withdrawal was attempted. However, the patient presented tonic-clonic seizures and anticonvulsant therapy was started. Cerebral neuroimaging revealed signs of anoxic encephalopathy. Increasing doses of vasopressors/inotropes were progressively necessary.

The patient developed multiple organ dysfunction with acute kidney injury requiring dialysis, coagulopathy with thrombocytopenia and worsening of respiratory exchanges. The patient died on the 6<sup>th</sup>-day postoperatively.

## DISCUSSION

TVEM occurs in approximately 1% of the TAVR procedures and is associated with increased mortality at 30 days and at 1 year.<sup>3</sup> Risk factors were attributed to positioning errors, manipulation of the valve, pacing failure, post-dilatation, sizing errors, the use of self-expanding or first-generation prostheses and presence of bicuspid aortic valves.<sup>3,4</sup> In case of TVEM, the patient may be asymptomatic and the migrated prosthesis be detected lately. A bail-out surgical or a percutaneous approach strategy must be promptly chosen by Heart Team, according to the treatment urgency, hemodynamic compromise, and migration location.<sup>5</sup> In case

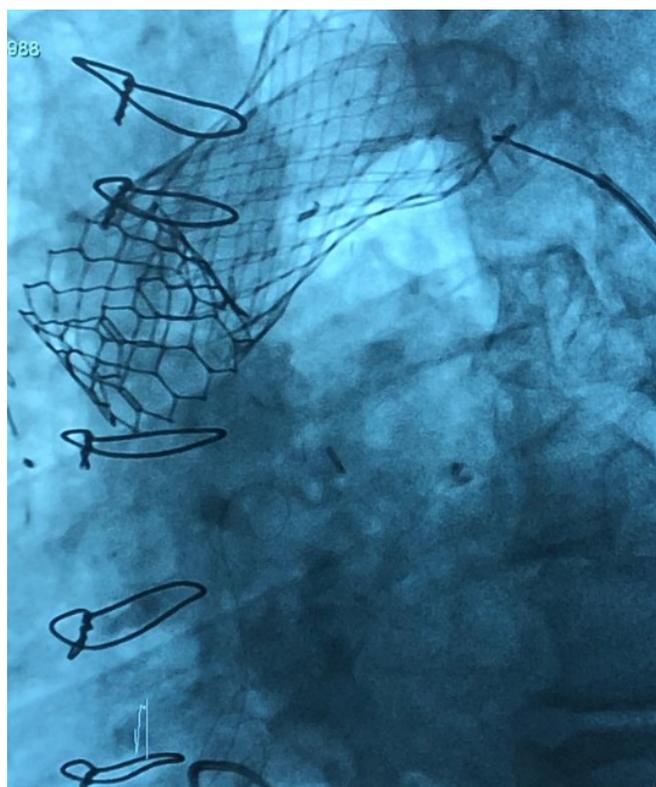


Figure 1. Final position of prosthesis in ascending aorta



Figure 2. Prosthesis explantation during cardiac surgery

of aortic embolization, following stabilization of the embolized prosthesis, a new attempt with a second transcatheter valve should be made.<sup>5</sup> In the TRAVEL study the conversion rate for open surgery was 19% among the cases with TVEM.

Treatment strategies that included conversion to surgery have shown worse outcomes. However, in this study conversion was not independently related to mortality, probably due to an overlap of the subsequent therapeutic approaches (repositioning, second valve implantation, and conversion to surgery).<sup>3</sup>

Reported emergent conversion rates to open-surgery during TAVR were low and embolization/dislocation of the prosthesis was the most common cause.<sup>6</sup> In this case, after double embolization with severe hemodynamic instability, the Heart Team went for conversion to open-heart surgery.

A cardiovascular hybrid room, involving a versatile operating environment with optimal imaging capability and a location next to interventional suites and ORs, is a key component to

a more readily management of unanticipated complications.<sup>7</sup> Despite increasing experience, the anesthesiologist should be aware for emergent conversion of local anesthesia and sedation to GA.<sup>8</sup>

In our center, it is common practice performing TAVR under conscious sedation combined with local anesthesia and transesophageal echocardiography, which was suggested in previous meta-analysis as being associated with shorter procedure time, fluoroscopy time, ICU and hospital length of stay, and reduced need for inotropic support.<sup>9</sup>

However, a randomized multicenter trial SOLVE-TAVI did not find significant difference between both types of anesthesia in terms of overall mortality, stroke, myocardial infarction, infection requiring antibiotic and acute kidney injury. GA led to a higher requirement for catecholamines without affecting procedural times, delirium, ICU and overall hospital stay.<sup>10</sup> Patient factors and preference, as well as center and operator experience, should play a major role in the decision-making regarding the optimal anesthetic type. Procedure complications is one of the major indications for conversion to GA.<sup>8</sup>

The anesthetic drugs should be meticulously chosen and titrated to avoid worsening of hypotension. Orotracheal intubation outside the operating room is associated with increased difficulties and risks. Apart from the anesthetic technique planned, the equipment and drugs required for GA and airway approach material should be available in the operation room.

The staff must be trained to assist immediate cardiopulmonary resuscitation. Airway control and maintenance of hemodynamic stability are the major concerns in anesthetic management when severe complications occur.

## CONCLUSION

A multidisciplinary Heart Team is essential for immediate management of potential life-threatening complications. The anesthesiologist has a significant role in all stages of the procedure, from the preoperative evaluation, choice of the safest anesthetic technique, and prompt adaptation of the anesthetic plan to unplanned situations. The anesthesiologist should have an adequate knowledge of the procedure and be ready to recognize and manage adverse events related to both procedural and anesthetic techniques.

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