

## An emergent surgery for valve migration in transcatheter aortic valve replacement

*Transkateter aort kapak replasmanında acil kapak migrasyonu cerrahisi*

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### ABSTRACT

Transcatheter aortic valve replacement is a common treatment method for patients with severe aortic stenosis, who are either at high-risk or non-eligible for surgery. One of the rare, but major complications of this method is valve migration, which usually occurs during the intervention. The assessment of the Heart Team before transcatheter aortic valve replacement is determinant for the “to-do list” for the bail-out procedure. Discussion of the possible major complications and interventional plans may save the patient’s life in case of life-threatening transcatheter aortic valve replacement complications. Herein, we report a successful surgical management of valve migration occurred during transcatheter aortic valve replacement in a low-risk patient with bicuspid aortic valve.

**Keywords:** Aortic stenosis; prosthesis failure; surgery; transcatheter aortic valve replacement.

Surgical aortic valve replacement (SAVR) is the mainstay treatment for severe aortic stenosis (AS) in patients with low-intermediate surgical risk. Thirty percent of patients with severe AS are non-eligible for SAVR, due to advanced age or comorbidities-related high operative risks.<sup>[1]</sup> In such cases, transcatheter aortic valve replacement (TAVR) is the preferred management modality. Severe peri-procedural TAVR complications such as paravalvular leakage, aortic and/or ventricular bleeding, tamponade, and malpositioning/migration of valve have been reported in up to 7.7% of the procedures.<sup>[2]</sup> One-percent of these complications requires an emergent cardiac surgery (ECS) with a

### ÖZ

Transkateter aort kapak replasmanı, cerrahi için yüksek riskli olan veya cerrahiye uygun olmayan şiddetli aort darlığı olan hastalarda sıklıkla kullanılan bir tedavi yöntemidir. Bu yöntemin nadir, ancak başlıca komplikasyonlarından biri de genellikle girişim sırasında meydana gelen kapak migrasyonudur. Transkateter aort kapak replasmanı öncesi Kalp Ekibinin değerlendirmesi, kurtarma işlemi olarak yapılacaklar listesini belirler. Muhtemel majör komplikasyonların ve girişimsel planların tartışılması, yaşamı tehdit eden transkateter aort kapak replasmanı komplikasyonları olması durumunda, hastanın hayatını kurtarabilir. Bu yazıda, biküspid aort kapaklı düşük riskli bir hastada transkateter aort kapak replasmanı sırasında gelişen kapak migrasyonunun başarılı cerrahi tedavisi sunuldu.

**Anahtar sözcükler:** Aort darlığı; protez yetmezliği; cerrahi; transkateter aort kapak replasmanı.

nine-fold higher mortality rate.<sup>[2]</sup> It is recommended that all potential TAVR patients should be assessed by the Heart Team to discuss the possible risks and benefits of each option and to inform the patient clearly and to identify beforehand the outlook of Heart Team in case of major peri-procedural complications. Herein, we report a successful surgical management of valve migration during TAVR in a low-risk patient with bicuspid aortic valve (BAV).

### CASE REPORT

An 81-year-old female patient was admitted with symptoms of exertional shortness of breath and angina.

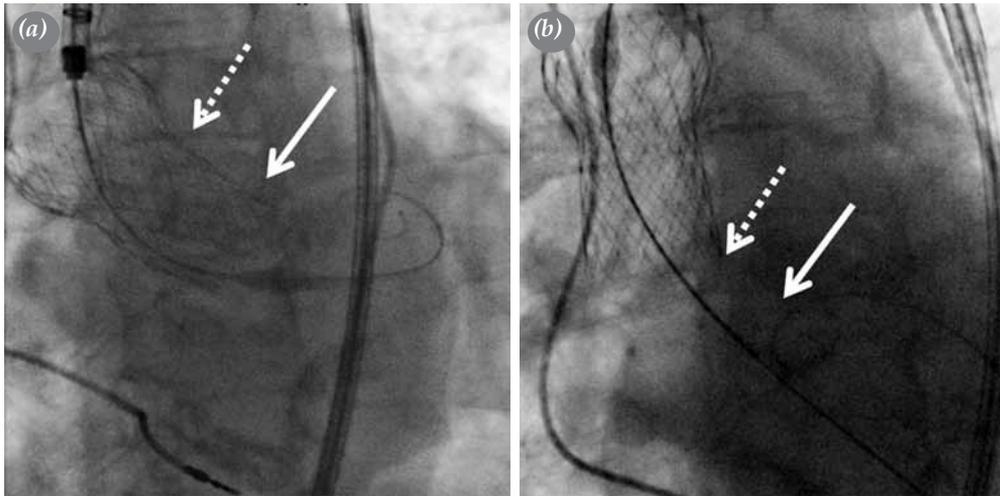


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**Figure 1.** (a) An angiographic view of Medtronic-CoreValve® prosthesis (Evolut-3R-26) before final delivery (Solid arrow shows the annulus of the native aortic valve and dotted arrow shows the sino-tubular junction). (b) Final position of prosthesis in ascending aorta before emergent surgery (Solid arrow shows the annulus of the native aortic valve and dotted arrow shows the sino-tubular junction).

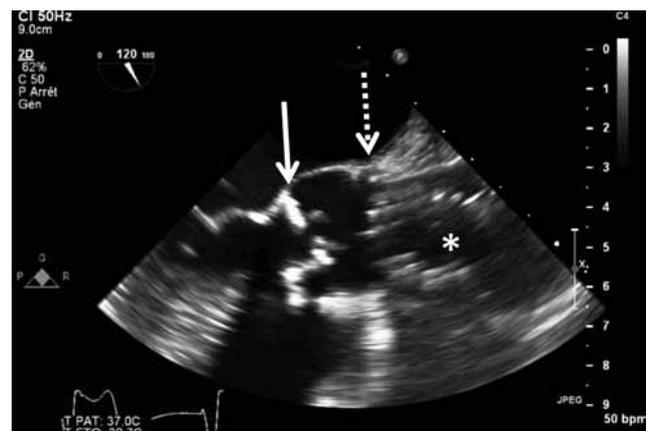
Coronary angiography showed normal findings. Transthoracic echocardiography revealed severely stenotic BAV with moderate calcifications and dilated ascending aorta of 42 mm in size. The patient was discussed in the Heart Team. Surgical aortic valve replacement was recommended by the surgical team, due to the patient's good physical and mental condition with 2.87% logistic EuroSCORE II. However, due to her advanced age, TAVR was chosen based on the patient's will and debates among the cardiologist and anesthesiologist.

Elective TAVR with Medtronic-CoreValve®-Evolut-3R-26 system (Medtronic Inc. Minneapolis, Minnesota, USA) was performed in the catheterization laboratory under local anesthesia. In the final step, the CoreValve® prosthesis migrated to the ascending aorta (Figure 1, 2). As a result, an ECS was performed to retrieve the migrated prosthesis. Through median sternotomy, cardiopulmonary bypass was instituted with aortic cannulation at the aortic arch level to avoid the CoreValve® struts. The prosthesis was removed after filling the aortotomy site with cold saline to soften the rigid nitinol struts (Figure 3). Following complete resection of BAV and annular calcifications, a Carpentier-Edwards-Perimount-Magna-Ease-21 bioprosthesis (Edwards Lifesciences, Irvine, CA, USA) was implanted. Superior hemi-sternotomy was initially planned for the patient, if the decision of the Heart Team would go for SAVR. However, full-sternotomy was performed, due to ECS, and to provide full access

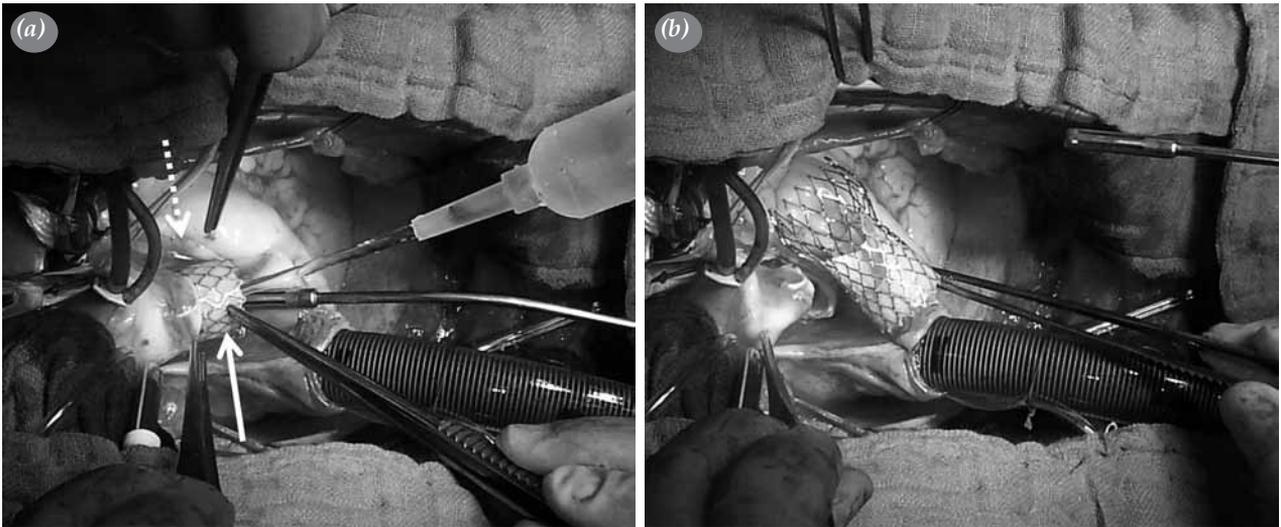
the extraction of the prosthesis. The postoperative course was uneventful, and the patient was discharged postoperative 16<sup>th</sup> day.

## DISCUSSION

Valve migration to the left ventricle or ascending aorta is one of the severe peri-procedural TAVR complications.<sup>[2]</sup> Migration to the left ventricle inevitably require ECS.<sup>[3]</sup> Although percutaneous-bail-out maneuvers (i.e., transcatheter valve-in-valve implantation) are advised for supra-annular migration in high-risk or inoperable patients, this



**Figure 2.** A perioperative transesophageal echocardiographic view of migrated Medtronic-CoreValve® prosthesis in ascending aorta (asterisks), bicuspid calcific native aortic valve (solid arrow), and sino-tubular junction (dotted arrow).



**Figure 3.** (a) An intraoperative view of migrated Medtronic-CoreValve<sup>®</sup> prosthesis (solid arrow) through aortic incision at the level of sino-tubular junction (dotted arrow). The surgical field is flushed with cold saline solution to soften the rigid nitinol struts of the prosthetic aortic valve for smooth extraction through aortotomy. (b) An intraoperative view of migrated Medtronic-CoreValve<sup>®</sup> prosthesis removed from ascending aorta.

option remains questionable in those with a low surgical risk. Therefore, in our case, SAVR was decided immediately after seeing the migration without losing time for percutaneous-bail-out maneuvers.

The Heart Team discussion for assessing and informing the patient is unequivocal for an accomplished institutional TAVR program. Assessing the potential TAVR patients by the surgical team is important for two reasons: First, patients may be provided clear information concerning both treatment types (TAVR/SAVR) by each expert. Second, in case of peri-procedural complications, particularly for patients with a low surgical risk, ECS decision can be taken faster. Upper struts of the CoreValve<sup>®</sup> prosthesis in our case were seen under the adventitia of the ascending aorta without creating any local hematoma, dissection or bleeding. Quick decision of ECS, based on pre-TAVR consultation, may have prevented a fatal outcome, which might develop during an additional bail-out intervention.

In addition, TAVR should be performed in a hybrid room with the appropriate surgical armamentarium on stand-by, as recommended by current guidelines.<sup>[3,4]</sup> This is essential to gain time and increase the survival likelihood, in case of having major peri-procedural complications. As our case was hemodynamically stable following valve migration to the ascending aorta, we preferred to transfer her to the operating

room to avoid postoperative infectious issues. In case of unstable or life-threatening conditions, the decision of performing the operation in the catheterization room should be balanced between infectious risks and mortality. Also, in a case series, Sener et al.<sup>[5]</sup> reported that the performance of TAVR procedures in catheterization rooms, where the sterilization guides are not as strict as they are in operating rooms, is a critical issue for prosthetic valve endocarditis following TAVR.

Although, the rate of major TAVR complications and mechanisms is controversial in the literature, the only common remark in all publications is the higher complication rates, including valve migration during the learning curve period.<sup>[6]</sup> In our case, based on the peri-procedural fluoroscopy images, we found that the mechanism of the CoreValve<sup>®</sup> prosthesis migration was incomplete disconnection from the delivery system of the new generation of CoreValve<sup>®</sup>, which has been recently adopted by our Cardiology Team. Therefore, a specifically trained Cardiology Team for these interventions should manage the patient, and during adoption of new techniques and TAVR valves, even if a former model was used, more vigilance and careful manipulations should be implemented.<sup>[7]</sup>

On the other hand, BAV is relative contraindication for TAVR, particularly for low surgical risk patients.<sup>[8]</sup> In registry reviews, patients with BAV who underwent TAVR had much higher

risks of paravalvular leakage, malpositioning or migration, perhaps due to their elliptical annular anatomy, irregular (often severe) annular-leaflet calcifications, and possible less holding-wrapping resistance on the implanted valve than in tricuspid aortic valves.<sup>[9]</sup> Moderate-to-severe paravalvular leakage in BAV patients were more common than non-BAV patients.<sup>[9]</sup> Mylotte *et al.*<sup>[10]</sup> found the moderate-to-severe aortic regurgitation incidence as high as 28.4% in BAV patients, while it was only 9% in CoreValve® pivotal trial, and 12.2% in Partner 1A trial. The annular diameters or working mechanisms of the currently available catheter-based valves may not be always compatible with the calcified and deformed shape of the BAV. Balloon-expandable valves have lower regurgitation rates and, possibly, should be used more often than self-expandable valves to exclude such complications. In addition, Mylotte *et al.*<sup>[10]</sup> found almost half the prevalence of significant aortic regurgitation following with balloon expandable (19.6%) than with the self-expandable (32.2%) valves in BAV patients.

In conclusion, this report supports the current concept that transcatheter aortic valve replacement is a promising option in high surgical risk patients, although it has still some limitations for low surgical risk patients, particularly those with bicuspid aortic valve. Appropriate selection of patients by the Heart Team and preoperative discussion of possible major complications and interventional plans may save patient's life in case of life-threatening complications. However, surgical aortic valve replacement remains standard of care for low surgical risk patients, particularly for those with bicuspid aortic valve.

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