

## Delayed Aortic Dissection after Transcatheter Aortic Valve Implantation

### Transkateter Aort Kapak İmplantasyonu Sonrası Geç Gelişen Aort Diseksiyonu

#### ABSTRACT

Transcatheter aortic valve implantation (TAVI) offers functional improvement for high-risk patients with aortic stenosis. Vascular complications after TAVI are known to occur frequently. Among them, aortic dissection is a rare but life-threatening vascular complication. We present a case of delayed aortic dissection following a successful TAVI.

**Keywords:** Aortic dissection, aortic stenosis, transcatheter aortic valve implantation

#### ÖZET

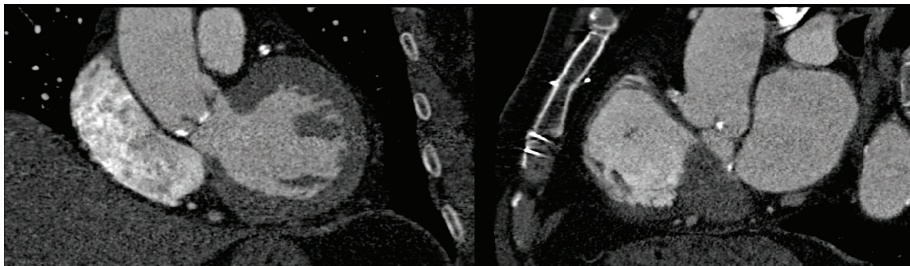
Aort darlığı olan yüksek riskli hastalarda transkateter aort kapağı implantasyonu (TAVİ) fonksiyonel iyileşme sağlamaktadır. TAVİ sonrası vasküler komplikasyonların meydana geldiği sıklıkla ifade edilmiştir. Aort diseksiyonu, TAVİ'nin nadir fakat hayatı tehdit eden vasküler komplikasyonlarından biridir. Burada, başarılı TAVİ işlemi sonrası gecikmiş aort diseksiyonu olgusunu sunuyoruz.

**Anahtar Kelimeler:** Aort diseksiyonu, aort stenozu, transkateter aort kapağı implantasyonu

Aortic dissection resulting from transcatheter aortic valve implantation (TAVI) is a rare yet catastrophic vascular complication. Its incidence rate stands between 0.2% and 0.3%.<sup>1</sup> Although there have been case reports on delayed aortic dissection, it typically manifests during TAVI.<sup>2</sup> Clinical data on its pathogenesis are limited. We present a case of delayed aortic dissection after a successful TAVI.

#### Case Report

A 73-year-old male patient, who had been experiencing New York Heart Association Class III dyspnea for a span of six months, was referred to our institution due to severe aortic stenosis. His past medical history highlighted conditions like hypertension, coronary artery bypass graft surgery, and chronic obstructive pulmonary disease. Transthoracic echocardiography illustrated an aortic valve area measuring 0.70 cm<sup>2</sup> with a mean gradient of 40 mmHg, all while preserving left ventricular systolic function. The logistic European System for Cardiac Operative Risk Evaluation (Euroscore) and the Society of Thoracic Surgeons (STS) score were 8.14% and 5.94% respectively, guiding the heart team to plan a TAVI procedure. Preceding the procedure, coronary balloon test (BT) was utilized to assess the aortic valve (Figure 1). Our patient then successfully



**Figure 1.** Aortic valve images from the coronal and sagittal computed tomography scans taken before the procedure.

#### CASE REPORT OLGU SUNUMU

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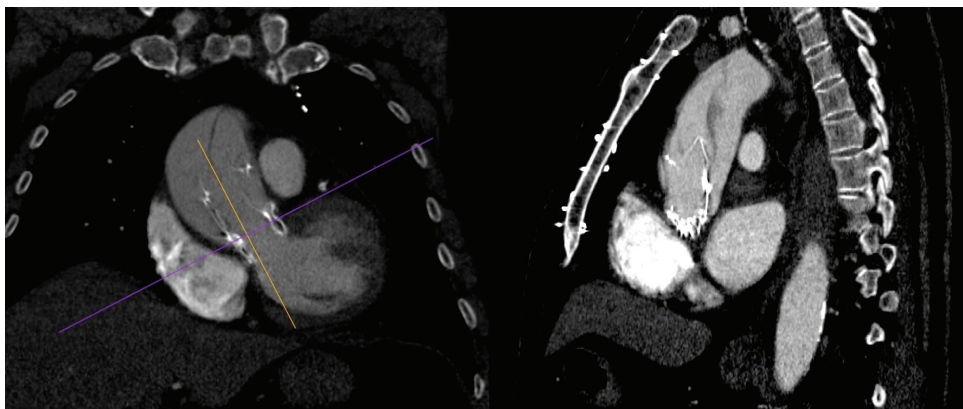
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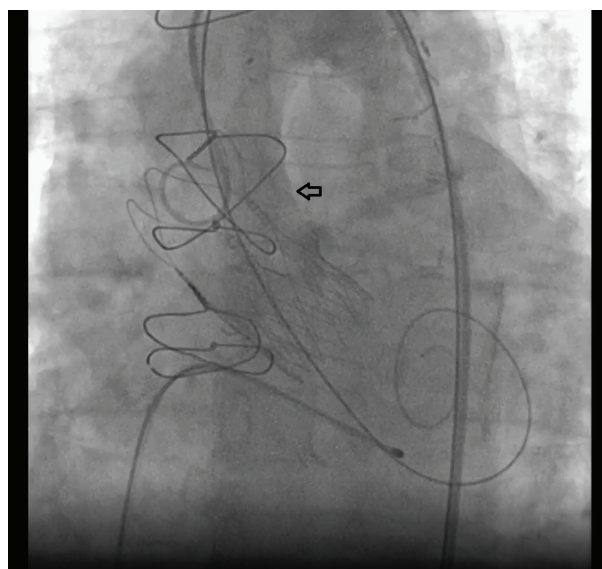


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**Figure 2. Aortic dissection visible in the sagittal and coronal computed tomography scans.**

received the self-expanding 27-mm ACURATE neo prosthesis (Symetis, Boston Scientific Corporation, Ecublens, Switzerland). Predilatation was performed before the implantation. Owing to the annular contact section of the valve not opening in a circular pattern, postdilatation was executed (Video 1). The subsequent aortography post-procedure depicted an absence of aortic regurgitation (Video 2). Hemostasis was realized through percutaneous vascular closure. An echocardiogram, conducted two days post TAVI, revealed commendable prosthesis functionality with a peak gradient of 9 mmHg, a mean gradient of 4 mmHg, and no evident aortic dissection. Exhibiting no symptoms, the patient was discharged on day three. However, a week later, he returned to the emergency department with ambiguous back and chest pains that had started two days prior. While the troponin levels were slightly off standard, they were clinically non-significant. Physical examination revealed symmetrical pulses in both arms and legs, and the blood pressure measurements in the left and right arms were identical. Yet, to rule out aortic dissection, a computed tomography (CT) scan was conducted. The CT scan showed a dissection flap that commenced at the aortic annulus and continued through the ascending aorta and aortic arch. Still, the dissection did not reach the abdominal aorta. An aneurysm in the ascending aorta, near the pulmonary body, measured an anteroposterior (AP) diameter of roughly 55 mm (Figure 2, Video 3). The patient was consulted about the planned surgery. The surgeons indicated a high risk for the surgical operation due to the patient's history of bypass and the recent bioprosthesis valve procedure. The patient declined the planned surgery and opted for medical treatment instead. Upon re-examination of the post-procedure angiography images, a suspicious dissection was observed after post-dilatation, as seen in Figure 3. However, it is easy to overlook this image because the patient's clinical status was stable, and there were no signs or



**Figure 3. Suspicious dissection image after post-dilatation.**

symptoms of aortic dissection during follow-up. He passed away five days later while in the ward.

### Discussion

This case underscores that aortic dissection, potentially stemming from TAVI, can lead to death within days and is not necessarily periprocedural, contrary to current understanding. Aortic dissection during the TAVI procedure is rare, with possible causes including manipulations of the delivery system, valve repositioning, retrieval, or retraction.

Delayed aortic dissection is a rare condition. Jacobsen et al.<sup>3</sup> reported a case of a 78-year-old patient who experienced delayed aortic dissection one month after a TAVI procedure. The patient was referred for an emergency operation. The postoperative course was uneventful, and the patient was discharged on the 13<sup>th</sup> postoperative day. They explained that, in this case, the mechanism could be due to valve malalignment with the longitudinal axis of the aorta. Moreover, during the operation, it was discovered that the dissection began at the level of the sino-tubular junction, and the valve cage was deeply embedded in the aortic wall. Gerber et al.<sup>4</sup> reported two cases where aortic dissection was confirmed by

### ABBREVIATIONS

AP	Anteroposterior
BPD	Balloon post-dilation
BT	Balloon test
Euroscore	European System for Cardiac Operative Risk Evaluation
PVL	Paravalvular leak
STS	The Society of Thoracic Surgeons
TAVI	Transcatheter aortic valve implantation

postmortem examination as the cause of death at 6 and 22 days post-TAVI, respectively. Additionally, Losmanova et al.<sup>5</sup> reported a case in which a tear in the ascending aorta, directly adjoining the upper edge of the valve, was confirmed as the cause of death by postmortem examination.

In the present case, the tear originated from the upper crown part of the valve, extending along the ascending aorta and aortic arch. The primary function of the upper crown part of the valve is to capture the native valve and facilitate supra-annular anchoring. In this instance, the upper crown may have caused the dissection due to increased mechanical stress on the aortic wall after post-dilation. Balloon post-dilation (BPD) has its advantages and disadvantages. It is not routinely recommended unless it is for reducing paravalvular leak (PVL), correcting frame underexpansion, or optimizing transvalvular gradients. Moreover, some studies have found it to be a potential cause of aortic annular rupture or damage.<sup>6,7</sup> Analyzing patients who underwent post-dilatation using the CoreValve system, Harrison et al.<sup>8</sup> found no differences in major vascular complications between cases that required BPD and those that did not. In this case, the goal was to correct frame underexpansion and minimize the patient-prosthesis mismatch. No pathological conditions were detected in the post-procedure angiography images or echo controls. Nonetheless, pinpointing the onset of the dissection was difficult. The dissection may have manifested clinically after starting dual or single antiplatelet therapy, as such therapy could impede the healing of an intimal tear.

### Conclusion

Aortic dissection that occurs either during or post-TAVI is an emergent condition with a high mortality rate. Patients may present to the emergency department with atypical or mild complaints, rather than the classic symptoms of aortic dissection. Consequently, its diagnosis can be challenging or delayed. To date, no detailed treatment protocol has been established for this condition. Moreover, open surgery for iatrogenic type A dissection is rarely described, particularly given the high mortality among frail patients. In the literature, there are instances of patients who underwent open surgery or received percutaneous treatment and survived.

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**Informed Consent:** Informed consent was obtained from the patient's family for the publication of this case report and any accompanying images.

**Peer-review:** Externally peer-reviewed.

**Author Contributions:** Concept – S.Ş.; Design – S.Ş., H.A.A.K.; Materials – H.A.A.K.; Analysis and/or Interpretation – H.A.A.K.; Literature Search – S.Ş.; Writing – S.Ş.; Critical Review – S.Ş., H.A.A.K.

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**Video 1.** Post-dilatation of the bioprosthesis aortic valve.

**Video 2.** Post-procedural aortography following valve implantation.

**Video 3.** View of aortic dissection using coronal computed tomography scan.

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