

## Kateter yoluyla aort kapağı yerleştirilmesi sırasında hemodinamik bozukluk ve ST-segment yükselmesi gelişen bir olgu

### Hemodynamic deterioration and ST-segment elevation developed in a patient during transcatheter aortic valve implantation

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**Özet**– Kateter yoluyla aort kapağı yerleştirilmesi son yıllarda cerrahi açıdan yüksek riskli, ciddi aort darlığı olan semptomatik hastalarda alternatif bir tedavi yöntemi haline gelmiştir. Ancak bu yeni tedavi yöntemi ile birlikte bazı ölümcül komplikasyonlar da görülmeye başlamıştır. Bunlardan biri işlem esnasında gelişen sol ana koroner arter ağzındaki tıkanıklıktır. Bu yazıda, kateter yoluyla aort kapağı yerleştirilmesi sırasında sol ana koronerde tama yakın akut tıkanma ve hemodinamik bozukluk gelişen ve başarılı balon anjiyoplasti ve stent işlemi uygulanan bir olgu sunuldu.

**Summary**– Transcatheter aortic valve implantation is becoming increasingly popular as an alternative treatment technique for symptomatic patients with severe aortic stenosis, who are at high risk for surgery. However, with this revolutionary treatment modality, some fatal complications have also emerged. One of these fatal complications is the occlusion of the left main coronary artery at the time of procedure. In this case report, we presented a case of a transcatheter aortic valve implantation complicated by acute left main trunk subtotal occlusion and hemodynamic collapse, which was successfully resolved by balloon angioplasty and stent implantation.

#### Abbreviation :

TAVI Transcatheter aortic valve implantation

Transcatheter aortic valve implantation (TAVI) has recently become an alternative treatment modality in patients carrying higher risk of surgery.<sup>[1]</sup> Although it is a noninvasive procedure, TAVI-related fatal complications can develop. Among them left main coronary artery occlusion is a rarely seen acute complication which requires rapid diagnosis, and urgent treatment.<sup>[2-7]</sup>

In this paper, successful percutaneous revascularization performed on a patient who developed hemodynamic instability as consequence of the left main coronary artery occlusion during TAVI procedure was presented.

#### CASE PRESENTATION

A 83-year-old female patient consulted to our clinic with complaints of dyspnea (NYHA 2-3) and accompanying chest pain emerged one year previously. Her medical history revealed previous diagnoses of hyperlipidemia, ischemic stroke, chronic obstructive pulmonary disease, and atrial fibrillation. On transthoracic echocardiograms

thickened aortic valve, calcifications especially on the left aortic valve leaflet in addition to concentric left ventricular hypertrophy were observed. Aortic ring was 23 mm in diameter at its origin, however it was 36 mm, and 38 mm at the levels of sinus of Valsalva, and sinoaortic junction, respectively. Besides diameter of ascending aorta (41 mm), area of the aortic valve (0.6 cm<sup>2</sup>/m<sup>2</sup>), maximal pressure gradient (60 mmHg) were also measured, and mild-moderate degrees of aortic, and mitral insufficiency were detected. This case was discussed in the joint-committee of cardiologists, cardiovascular surgeons, and cardiac anesthesiologists, and the patient was evaluated as having higher surgical risk (EuroSCORE 22%, STS - Society of Thoracic Surgeons 14%), and accordingly TAVI was planned. Preprocedural coronary angiography detected coronary artery plaques. On aortograms the distance between aortic ring, and the left main coronary artery was measured as 11 mm, and grade 2 aortic insufficiency was detected. (Figure 1a). Peripheral angiography demonstrated presence of a plaque on the proximal segment of the left common iliac artery. In addition, both iliac arteries were calcified, and slightly tortuous.

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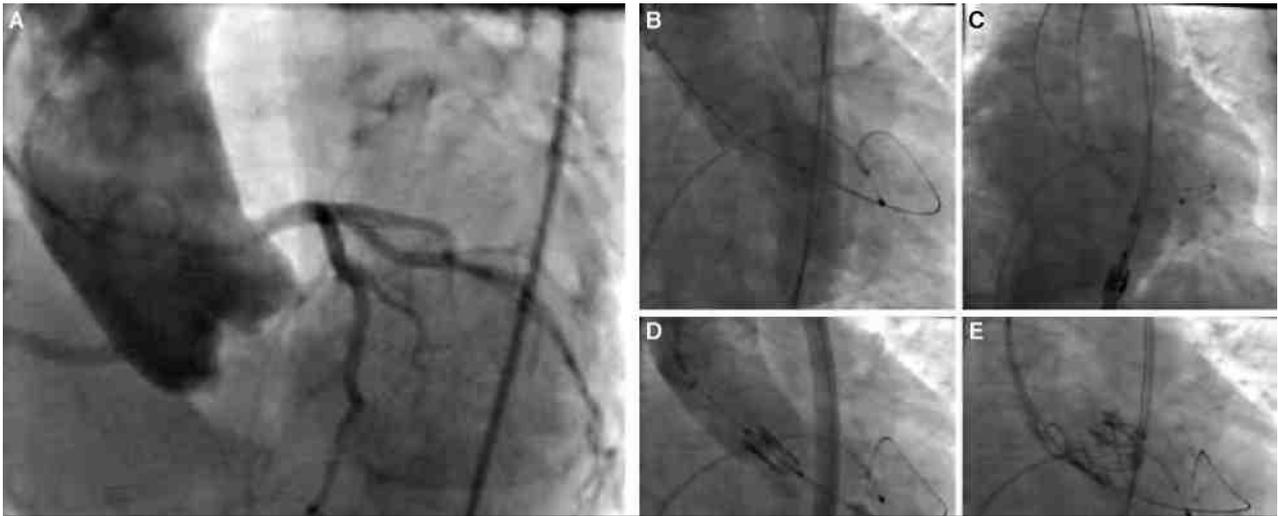


Figure 1. (A) Determination of the distance between aortic ring, and the left main coronary artery orifice in simultaneously obtained angiograms of the ascending aorta, and the left main coronary artery (B) Balloon dilation procedure performed before prosthetic valve implantation, (C) Forwarding prosthetic valve over the delivery system, (D, and E) implantation of the prosthetic valve on aortic ring

Patients eligible for TAVI were scheduled for transfemoral implantation of Edwards Sapien (Edwards Lifesciences, Irvine, CA, USA) aortic valve. Priorly, right femoral vein was punctured, and a transient pacemaker was advanced over a 6F sheath catheter onto right ventricular apex. Then a 7 F sheath catheter was engaged into left common femoral vein, and a straight tip catheter was advanced beyond aortic valve with the aid of an Amplatz catheter. Then aortic valve was dilated using a 23 mm balloon. Afterwards under application of rapid pacing, a 26 mm Edwards Sapien XT boprosthetic valve was implanted over an 18F NovoFlex delivery system (Figure 1b-e).

Following implantation of the aortic valve, ST – segment elevation, and serious hypotensive episode occurred which necessitated application of control coronary artery angiography which demonstrated nearly complete occlusion of the left main coronary artery (Figure 2a). Then, firstly the left main coronary artery was dilated with a 2.75 x 20 mm sized balloon, and a 4.5 x 9 mm bare metal stent was implanted (Figures 2b, and c). After stenting, patient’s hemodynamic state improved markedly, and on ECG, ST-segment returned to isoelectric line. Following procedure, access site into the left main coronary artery was closed with XL percutaneous sutures.



Figure 2.(A) Nearly complete occlusion of the the left main coronary artery orifice (B) stentin procedure, and (C) control angiogram

Transthoracic echocardiographic examination performed 24 hours later demonstrated a marked decrease in aortic valve gradient (15/6 mmHg), and the patient was discharged with complete cure on the 6. day of her hospitalization

## DISCUSSION

Although transcatheter aortic valve replacement is an alternative for symptomatic patients with serious aortic stenosis who carry higher risks for surgery, one should be careful about procedural complications. As is observed in our case, though rarely, life-threatening complications as occlusion of the left main coronary artery can develop. [1] In various studies, the incidence of TAVI-related left main coronary artery occlusion was 0.6 percent. [1-4] The experience of the surgeon, shorter ( $\leq 10$  mm) distance between the orifice of the left main coronary artery, and aortic ring, relatively longer left aortic valve, narrower aortic annulus, stenotic ascending aorta at the level of sinus of Valsalva, and hypertrophy of the interventricular septum can be enumerated among conditions which might predispose to this complication. [1-5] Besides, Fiorina et al. [9] and Gurvitch et al. [10] also reported development of left coronary artery occlusion following TAVI procedure applied through degenerated bioprosthetic valve. However in our case, we thought that relatively shorter distance between aortic ring, and the ostium of the left main coronary artery (11 mm), severely calcific aortic valve, and hypertrophy of the interventricular septum (14 mm) were predisposing factors for the development of this complication. Occlusion probably developed as a result of nearly complete closure of the left main coronary artery with longer calcific left aortic valve. Less likely possibilities include vasospasm, atheromatous plaques affecting aortic root, embolism, and intramural hematoma. If intravascular ultrasonographic examinations were performed during the procedure, we could obtain more detailed information about the underlying cause. However considering urgency of relieving the complication, and its related mortality, we had not enough time to perform intravascular ultrasound..

The occlusion of the left main coronary artery is a serious complication which requires establishment of urgent diagnosis as far as possible. Following transcatheter aortic valve replacement, after excluding serious valvular insufficiency, and rupture, in cases of persistence of impaired hemodynamic status despite treatment, critical ST-segment depression or elevation, and development of alarming left ventricular wall mobility disorders, and detection of occlusion in coronary artery angiography, one should suspect of the left main

coronary artery occlusion, and emergency revascularization should be performed.

In our case, the left main coronary artery lesion was successfully revascularized using percutaneous coronary balloon catheterization, and stenting. In such cases with failed percutaneous interventions, coronary artery bypass procedures can be also applied. [5]

In order to refrain from these kinds of complications, the distance between aortic valves, and the orifice of the left main coronary artery should be meticulously measured before the procedure during computed tomography or aortography. If computed tomographic examination were performed in our patient, it would be possible to have an at least some idea about the risk of this complication. In cases where a borderline distance was measured on aortograms, advanced evaluation using computed tomographic methods will be helpful. In cases under potential risk of this complication, it has been recommended that as a prophylactic measure before valvular replacement, a 0.014 inch guide wire can be advanced through a guide catheter into the left anterior descending artery to be used in case of need. [5,6]

In conclusion, left main coronary artery occlusion is a very rarely seen intraoperative complication of TAVI but unfortunately with fatal consequences. Therefore before the procedure the patient should be carefully evaluated for possible occurrence of these complications, and hemodynamic deterioration, ST segment alterations during valvular replacement, and detection of left main coronary artery occlusion should lead the surgeon to apply emergency revascularization

*Conflict of interest: None declared*

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*Anahtar sözcük/ler:* Anjiyoplasti, balon, koroner; aort kapağı darlığı/ tedavi; kalp kapak protez implantasyonu/yöntem; kalp kateterizasyonu; koroner anjiyograf; koroner tıkanıklık; stent.

*Key words:* Angioplasty, balloon, coronary; aortic valve stenosis/therapy; heart valve prosthesis implantation/methods; cardiac catheterization; coronary angiography; coronary occlusion; stents.