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Case Report

A case of acute coronary syndrome caused by delayed coronary ischemia after transcatheter aortic valve implantation

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ABSTRACT

An 84-year-old female patient suffered from dyspnea due to severe aortic stenosis. Several comorbidities and her advanced age made her acceptable for transcatheter aortic valve implantation (TAVI).
The TAVI procedure was performed via a femoral access and a 26-mm CoreValve prosthesis (Medtronic, Minneapolis, MN, USA) was implanted. The prosthesis was deployed at a high position because of short distance between the annulus base and coronary arteries. Aortic angiography indicated normal contrast flow into both coronary arteries.
Six months later she was readmitted to our hospital because of acute coronary syndrome. Although selective intubation of coronary arteries could not be achieved because of high valve position, both coronary arteries seemed to be well contrasted. As a consequence, the second coronary angiography was undertaken because of recurring chest pains. The aortic root angiogram showed a decreased contrast flow into both coronary arteries. During the examination she deteriorated rapidly, developed cardiopulmonary arrest, and a percutaneous cardiopulmonary support and an intra-aortic balloon pump needed to be inserted. She was then transferred to the operating room for aortic valve replacement. This is the first case of delayed coronary ischemia after TAVI, necessitating the removal of an implanted CoreValve and its replacement with a new prosthetic valve.
<**Learning objective:** The higher position of the CoreValve implanted in the transcatheter aortic valve implantation (TAVI) procedure can rarely induce coronary obstruction, especially in patients with low lying coronary ostia and a small sinus of Valsalva. Percutaneous coronary intervention and coronary artery bypass graft are sometimes difficult in these patients, and replacement of the prosthetic valve may be an alternative. Patients with higher CoreValve position require close follow up to recognize any coronary perfusion defects at an early stage.>

Introduction

Transcatheter aortic valve implantation (TAVI) has been attracting attention as an alternative to surgical aortic valve replacement in patients who are a high risk for surgery [1]. TAVI is still associated with complications including cerebrovascular events, conduction abnormalities, and residual aortic regurgitation [1]. TAVI has also been associated with rare, but life-threatening complications, such as coronary obstruction [2].

Two TAVI systems are currently in wide use: the balloon-expandable Edwards Sapien valve (Edwards Lifesciences, Irvine, CA, USA) and the self-expandable Medtronic CoreValve (Medtronic, Minneapolis, MN, USA).

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We present a case of acute coronary syndrome caused by delayed coronary ischemia after a TAVI procedure using a CoreValve.

Case report

An 84-year-old female patient suffered from dyspnea due to severe aortic stenosis (AS) with normal systolic function. Several comorbidities and her advanced age made her acceptable for TAVI.

Echocardiography confirmed AS with an aortic valve area of 0.44 cm^2 and a peak gradient of 77 mmHg. The aortic annulus with severe calcification was 15.7 × 23.0 mm as measured by computed tomography (CT). The sinotubular junction (STJ) diameter was 22.5 × 22.6 mm. The distance between the STJ and right coronary cusp was 19.0 mm and left coronary cusp was 17.3 mm. The sinus of Valsalva diameter was 27.3 × 28.7 mm. The distance between the annular plane and right coronary ostia was 13.7 mm and left coronary ostia was 12.5 mm.

The TAVI procedure was performed via a femoral access and a 26-mm CoreValve prosthesis was implanted using a standard technique. We chose the self-expandable CoreValve which had just become available in Japan instead of the balloon-expandable Sapien valve because of concerns about aortic root rupture, as CT indicated that the aortic annulus had severe calcification. In order to avoid conduction disturbances and to minimize the risk of paravalvular regurgitation, the prosthesis was to be positioned high, with a target implantation depth of 4–6 mm. Although the prosthesis was then deployed at a high position at a depth of −2 mm unintentionally, aortic angiography indicated normal contrast flow into both coronary arteries (Fig. 1).

After six months she was readmitted to our hospital because of acute coronary syndrome. Her levels of troponin I were elevated, and coronary angiography was done. Selective intubation of coronary arteries could not be achieved because of high valve position. However, main trunks of both coronary arteries seemed to be well contrasted with cusp shot. One month before readmission, she had myocardial scintigraphy that showed anterior partial ischemia. We considered diagonal branch as the culprit vessel for acute coronary syndrome. She had received additional oral treatment including beta-blocker after the first coronary angiography, during all that time her chest pain disappeared. Two weeks later, the second angiography was undertaken because of recurring chest pains. The aortic root angiogram showed decreased contrast flow into both coronary arteries. Also, selective intubation of coronary arteries could not be achieved. However, contrast flow seemed to go around from left coronary cusp to right coronary cusp. During the examination, the patient's condition deteriorated rapidly, she went into cardiopulmonary arrest, then a percutaneous cardiopulmonary support and an intra-aortic balloon pump needed to be inserted.

At first, cardiac surgeons tried to perform urgent aortocoronary bypass surgery. However, they decided to perform aortic valve replacement for the following reasons. First, her great saphenous veins were too thin to be used for graft. Second, the distance between aorta and coronaries seemed too far for anastomosis using graft, even if great saphenous veins were harvested, because the distal end of CoreValve was located around the bifurcation of brachiocephalic trunk at a high valve position. Finally, it would be difficult to harvest internal thoracic arteries within activated clotting time of 400 s under heparin administration.

A CoreValve mainly consists of a frame, a sealing skirt (transition zone) and a valve. In general, coronary perfusion was maintained from aorta to the sinus of Valsalva through a frame. The intraoperative finding showed that the sealing skirt of CoreValve

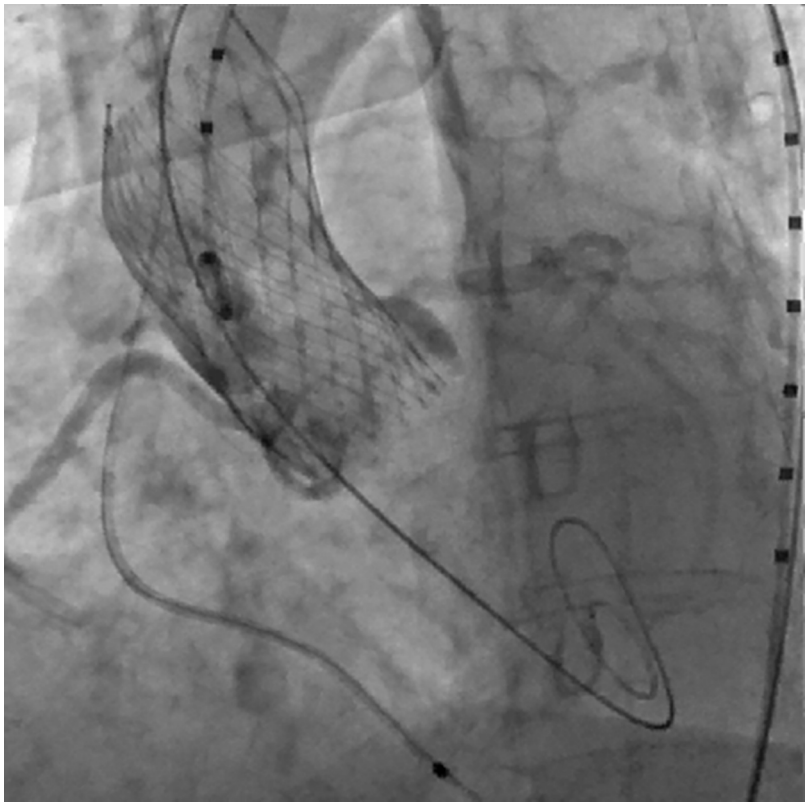

Fig. 1. The first coronary angiographic finding. The 26-mm CoreValve prosthesis was deployed at a high position, at a depth of −2 mm. Aortic angiography indicated normal contrast flow into both coronary arteries.

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