Percutaneous Coronary Intervention in TAVI Candidates: A Report of Two Cases

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Abstract

Coronary artery obstruction is a rare complication of transcatheter aortic valve implantation (TAVI). Bulky calcified aortic valve and ostial lesions of the coronary arteries are known risk factors for coronary artery obstruction. No consensus guideline has been proposed for treatment in these circumstances. We present two cases of patients with severe aortic valvular stenosis and concomitant left-main
lesions, both treated with TAVI but with different coronary artery treatment strategy.

**Keywords**: TAVI, coronary disease, PCI

**INTRODUCTION**

In recent years transcatheter aortic valve implantation (TAVI) emerged as an effective option for treating aortic stenosis in patients with high-risk for surgical valve replacement. Among most often encountered complications of TAVI are postprocedural aortic regurgitation, atrioventricular block, stroke and access-site complications. Less commonly obstruction of the coronary ostium has been observed. Bulky calcified native aortic valve may obstruct the coronary ostium after it is displaced by the valve prosthesis. Stenosis of the left main coronary artery (LM) or ostial right coronary artery (RCA) presents additional risk. No consensus guideline has been proposed for treatment in these circumstances. We present two cases of patients with severe aortic valvular stenosis and concomitant LM lesions who were treated with TAVI.

**CASE 1**

In October 2009, an 88-year-old female patient with aortic stenosis and clear cell carcinoma of the uterus was referred to our department by her gynecologist. Aortic stenosis was discovered during diagnostic workup prior to gynecological surgery. She was only mildly symptomatic with dispnoe at exertion. Transthoracic echocardiographic (TTE) examination revealed severe aortic stenosis with mean aortic valve area (AVA) of 0.75 cm$^2$ and mean aortic valve gradient (MG) of 35 mmHg. Left ventricular systolic function was normal. Coronary angiography revealed a non-significant lesion of the LM ostium. Her logistic EuroScore was 13 %. Percutaneous aortic valve replacement was planned due to the comorbidities. Additional workup showed highly tortuous and calcified iliac arteries. Our multidisciplinary team decided for transapical implantation of a 23 mm Edwards SAPIEN aortic valve (Edwards Lifesciences, USA). The procedure was performed under general anesthesia and with the transesophageal echocardiographic (TEE) guidance. At first, bilateral femoral artery access was obtained. A Judkins right 4.0 6Fr diagnostic catheter was used for supravalvular aortic angiography. To prevent coronary artery occlusion during valve implantation as the LM ostium was stenosed, the left coronary artery was protected with the guide wires. To insert the guide wires, a Judkins left 4.0 6Fr guiding catheter was introduced through the right femoral artery and placed at the left coronary ostium. HI-TORQUE BMW 0.014” coronary wires (Abbott Vascular, USA) were positioned in the distal LAD and the distal LCX (Figure 1). The guiding catheter was then retracted into the ascending
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aorta. During rapid ventricular pacing, the Edwards SAPIEN aortic valve was implanted through the transapical route. Immediately after the implantation of the valve a minor aortic regurgitation was noted on the supravalvular aortic angiogram as well as on the TEE. The coronary ostia were not affected and no other complication was encountered during the procedure. The patient was discharged from hospital ten days later.

CASE 2

In January 2011, an 82-year-old male patient with severe aortic stenosis (AVA ~ 0.7 cm², MG ~ 33 mmHg) and concomitant high surgical risk (logistic EuroScore 27%) was admitted for TAVI treatment. He had history of coronary artery disease with surgical revascularisation performed in 1997. He received left internal mammary artery (LIMA) bypass graft to the LAD and saphenous venous bypass grafts to the first diagonal branch and to the distal RCA. In preparation for TAVI, coronary angiography revealed a 50% stenosis in the mid LM and significant lesions in the proximal LCX and the PDA. Lesions in the LCX and the PDA were treated percutaneously. Our multidisciplinary team decided for transfemoral implantation of a 29 mm CoreValve (Medtronic, USA) aortic valve prosthesis (Figure 2). The implantation underwent uneventfully. Several hours after the procedure the patient experienced severe chest pain with newly developed left bundle branch block and troponin elevation. Repeated coronary angiography revealed significant stenosis of the LM. Judkins left 4.0 Fr guiding catheter was introduced through the CoreValve frame struts and placed at the left coronary ostium. ASAHI Prowater 0.014” coronary wires (Abbott Vascular) were advanced in the distal LAD and the distal LCX. The lesion was predilated with a 2.5x10 mm semi-compliant balloon and a Flexmaster (Abbott Vascular, USA) 3.0x9 mm bare metal stent was implanted. Final angiography showed good result of LM stenting. Position of the valve prosthesis was not disturbed by the percutaneous coronary intervention (PCI). Further inhospital stay was free of complication. At five months follow-up, the patient was symptom-free and in good general condition.

DISCUSSION

Coronary obstruction is a rare and potentially fatal complication of TAVI. In the SOURCE registry it was observed in 0.6 % of cases. The risk of coronary obstruction is hard to predict, however it is likely associated with the bulkiness and calcifications of the native valve leaflets, the position of the coronary ostia, and the size and shape of the sinuses of Valsalva and the aortic root. All of these need to be assessed during the diagnostic workup. Stenoses of the coronary ostia present additional risk. Therefore, the European Association of Cardio-Thoracic Surgery and the European Society of Cardiology note in their joined position statement.
that TAVI is probably not recommended in patients with severe proximal coronary stenoses not amenable to PCI. Individualized treatment decision based on the patient’s clinical condition and coronary anatomy is proposed when PCI is feasible. In the two presented cases different coronary artery treatment strategy was chosen. Both patients had non-significant LM lesions and no PCI in the LM was performed before TAVI. The first patient had an ostial LM lesion, therefore we decided to protect the ostium with two 0.014” guide wires inserted into the distal LAD and the distal LCX. Inserted guide wires served as a landmark during TAVI as well as an access route for a possible PCI. After successful valve implantation the ostium remained unaffected. The second patient had a stenosis in the mid LM, therefore we decided that no protection of the LM ostium was needed. Indeed, there were no complications during the procedure. Worsening of the LM stenosis in the hours following the procedure could have been caused by the expansion of the prosthesis-frame struts or by small coronary emboli. Successful PCI of the LM stenosis was performed after introducing the coronary guiding catheter through the CoreValve frame struts. No prosthesis displacement ensued. In conclusion, despite being rare coronary obstruction during TAVI has to be anticipated. It may be wise to protect the coronary ostium during TAVI in cases of pathoanatomical circumstances indicating a greater risk of coronary obstruction, including ostial and proximal coronary artery stenosis. In cases of subacute coronary artery obstruction PCI can be performed by introducing the guiding catheter through the prosthesis-frame struts, although this maneuver could result in valvular prosthesis displacement.

REFERENCES


FIGURE 1
Protection of the left coronary ostium during TAVI with two guide-wires placed in the LAD and the LCX. The Judkins right diagnostic catheter was used for supravalvular aortic angiography. The Judkins left guiding catheter was retracted prior to valve placement. Control angiography after Edwards-Sapien TA 23 mm valve implantation showed mild aortic regurgitation and normal coronary flow.

FIGURE 2
Control angiogram several hours after CoreValve 29 mm implantation showed important stenosis of the mid LM. Judkins left 4.0 6Fr guiding catheter was introduced through the CoreValve frame struts and placed at the left coronary ostium. The lesion was predilated with a semi-compliant balloon and a bare-metal stent was implanted.
LIST OF ABBREVIATIONS

AVA  aortic valve area
LAD  left anterior descending coronary artery
LCX  left circumflex coronary artery
LM   left main coronary artery
MG   mean gradient
PCI  percutaneous coronary intervention
PDA  posterior descending coronary artery
RCA  right coronary artery
TAVI transcatheater aortic-valve implantation
TEE  transesophageal echocardiography
TTE  transthoracic echocardiography

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