Transcatheter valve-in-valve implantation for sutureless bioprosthetic aortic paravalvular leak in the era of COVID-19

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Introduction

In this report, we presented a case of a 70-year-old man who underwent surgical aortic valve implantation with sutureless bioprosthetic valves shortly before the COVID-19 outbreak in Turkey. He developed symptoms of heart failure during follow-up, and presented to our hospital 3 months later due to the pandemic when he was treated with valve-in-valve transcatheter aortic valve implantation (TAVI).

Case Report

A 70-year old male patient was presented to our clinic with the complaints of increasing dyspnea and edema after aortic valve surgery. It was revealed from his medical history that he had been operated 3 months before because of severe aortic stenosis, but he could not present to the hospital due to COVID-19 pandemic. The records of the operation showed that he had been implanted with Perceval M sutureless valve (Sorin Biomedica, Sallugia, Italy), and his coronary arteries were normal. His transthoracic echocardiography results revealed gradient of 32/17 mm Hg and severe paravalvular failure in the bioprosthetic aortic valve. His left ventricular systolic function was found to be normal. He had complaints of dyspnea and dry cough but not fever and history of suspicious contact. COVID-19 test was performed twice, which showed negative result. Blood cultures were collected for infective endocarditis, no proliferation was found. Thoracic computed tomography was performed for pulmonary embolism and COVID-19, and no thrombus or infiltration was found. After COVID-19 was ruled out, he underwent transesophageal echocardiography (TEE), which revealed severe paravalvular failure jet in the bioprosthetic valve in right cusp (RCC) region (Fig. 1, Video 1). His thoracic computed tomography showed that Perceval M valve's RCC part was infolded (Fig. 2). He was evaluated by the heart team, which decided to perform TAVI with valve-in-valve technique, as he was at high risk for redo surgery.

Valve-in-valve TAVI was performed with fluoroscopic guidance and TEE monitoring and with the patient under mild sedation. Percutaneous common femoral arterial and venous access was achieved, with 14F sheath placement in the left common femoral artery. Aortography was performed first which showed severe aortic failure, and its location was confirmed (Video 2). A guidewire was then advanced through the prosthetic aortic valve orifice. Then, an Edwards SAPIEN XT balloon expandable 23-mm valve (Edwards SAPIEN XT, Edwards Lifesciences INC, Irvine, CA, USA) that was suitable for the inner size of the existing Perceval M valve was implanted successfully during fast right ventricular pacing with high-pressure balloon inflation (Fig. 3). His aortography showed that paravalvular leak flow disappeared after the procedure (Video 3). The control echocardiography demonstrated that there was

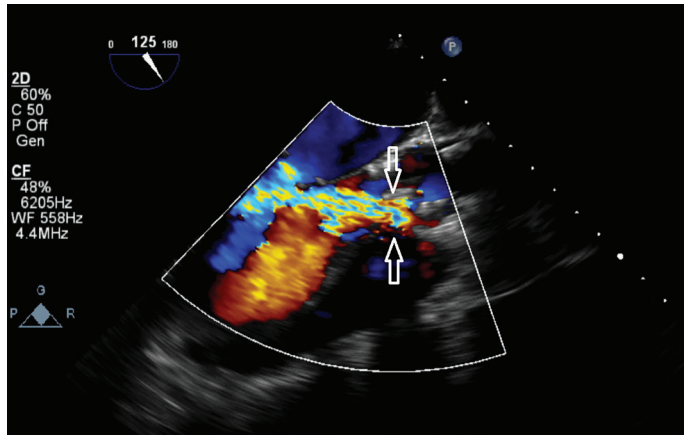

Figure 1. Severe paravalvular aortic regurgitation observed in the RCC region on TEE

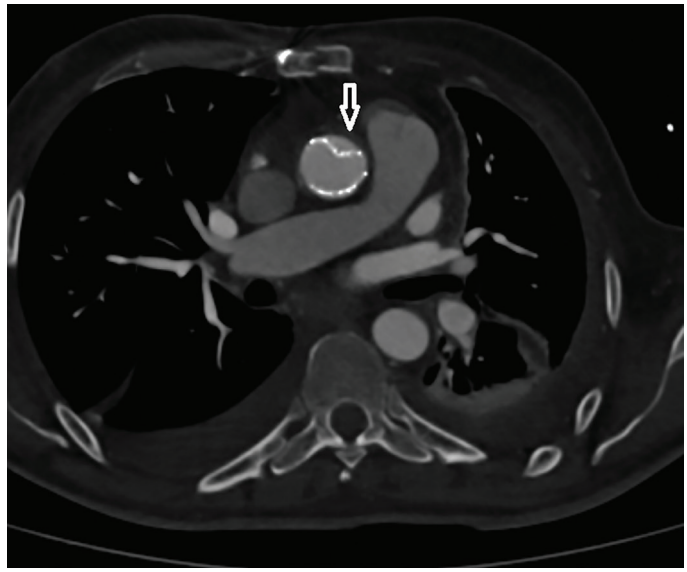

Figure 2. Stent-infolding of Perceval M valve observed on thoracic computed tomography

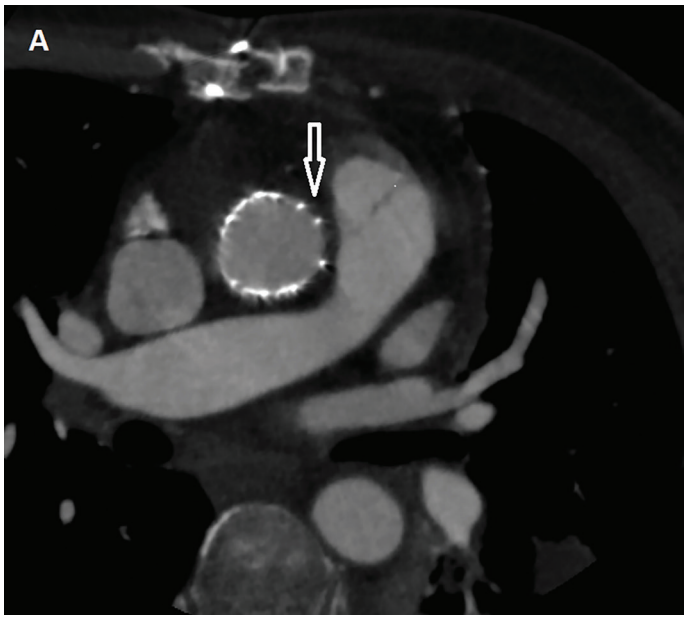

Figure 3. Control tomography after valve-in-valve procedure revealed that stent-infolding of Perceval M valve was resolved

no aortic failure and the valve's gradient was 24/11 mm Hg. He was discharged 5 days after the procedure without any complications. Control tomography performed 15 days after the valve-in-valve procedure showed that the invagination of Perceval M valve was resolved (Fig. 3). The patient is still asymptomatic and under follow-up.

Discussion

The new technology sutureless valve such as Perceval M has shorter cross-clamp time, can be implanted with less invasive procedures, and has better hemodynamic results; therefore, this is preferred by some cardiac surgeons (1). However, sutureless design of these valves might lead to paravalvular leakages, valve dislocation, and stent-infolding. It was argued that paravalvular leakage was caused by incorrect positioning of the valve usually due to insufficient decalcification in the annulus (2, 3). Some patients may develop paravalvular leakage postoperatively like patient in our case. We did not know exactly when the valve was deformed in this reported case, because his early postoperative period coincided with the most severe period of COVID-19 pandemic in Turkey, and he could not see us for follow-up. However, his history revealed that he was relatively untroubled in early postoperative period. Symptoms of heart failure started during the follow-up, which suggests that the stent-infolding of the valve might occur in the late postoperative period.

Degenerative changes may occur in bioprosthetic valves in 7–10 years, and there may be a need for redo surgery (4–6). As severe paravalvular failure developed in relatively early period in our patient, the main problem might be associated with malposition of the valve or an undetected structural problem in the valve rather than degeneration.

Current guidelines recommend redo surgical aortic valve replacement as the standard of care for the treatment of bioprosthetic dysfunction. However, usually elderly patients, those with multiple comorbidities leading to a high surgical risk, develop aortic bioprosthesis failure. There are a limited number of studies that compared the redo surgery and valve-in-valve TAVI techniques for the treatment of valve degeneration. Most of these studies demonstrated that patients in valve-in-valve TAVI group had more comorbidities. However, most studies reported similar mortality rates between the groups; vascular complications were found to be higher in valve-in-valve TAVI group; and the need for permanent pacemaker implantation and dialysis was higher in the group of redo surgery despite selection bias (7–10). Therefore, treatment of these patients should be individualized, and it should be remembered that valve-in-valve TAVI option can be used for high-risk patients.

Conclusion

Valve-in-valve TAVI may be an ideal treatment option for patients at high risk for redo surgery and for patients with sutureless aortic bioprosthesis dysfunction.

Informed consent: The patient has given informed consent to the publication of this case report, including the results of imaging methods.

Video 1. Severe paravalvular aortic regurgitation observed in the RCC region on TEE.

Video 2. Severe aortic insufficiency on aortography prior to valve-in-valve procedure.

Video 3. Aortic insufficiency disappeared after valve-in-valve procedure on control aortography.

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DOI:10.14744/AnatolJCardiol.2020.62884