Apical Aortic Valve Implantation in a Patient With a Mechanical Valve Prosthesis in Mitral Position

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A 67-year-old man diagnosed with severe aortic stenosis was admitted to our institution with pulmonary edema. The patient had a history of severe pulmonary fibrosis (total lung capacity, 57% of predicted value; diffusing capacity for carbon monoxide, 33% of predicted value) and had undergone coronary bypass grafting and mitral valve replacement with a St Jude mechanical valve (St Jude Medical, St Paul, Minn) 18 years ago. Doppler echocardiography showed a mean aortic gradient of 36 mm Hg, an aortic valve area of 0.50 cm², and a left ventricular ejection fraction of 45%. Although the mean predicted operative mortality by the Society of Thoracic Surgeons score was 7.5%, the patient was considered at too high risk for surgical aortic valve replacement because of his pulmonary condition, and he was then evaluated for percutaneous aortic valve implantation (PAVI). Transesophageal echocardiography (TEE) showed an aortic annulus of 23 mm as well as proximity between the mitral prosthesis and the aortic annulus (Figure 1A). Contrast computed tomography showed the presence of moderate stenosis and severe calcification of both iliofemoral arteries precluding transfemoral PAVI, and the patient was then proposed for transapical PAVI.

The procedure was performed in the operating room under TEE and fluoroscopy guidance by a team of cardiac surgeons and interventional cardiologists using the techniques extensively described in previous reports.1–3 Concerns about the interference of the mitral mechanical prosthesis with the expansion of the new aortic valve and the potential increased risk of valve embolization led us to perform balloon valvuloplasty by transfemoral approach with a 23-mm balloon just before thoracotomy. After valvuloplasty that showed the stability and complete expansion of the balloon, a left anterior minithoracotomy was performed to expose the apex, and 2 large pursestrings with pledgets were placed at the left ventricular apex. After puncturing the apex, a stiff guidewire was positioned in the descending aorta, and a 26F sheath was placed. The guidewire was then advanced into the aortic root under TEE and fluoroscopy guidance, and a 29-mm Edwards supra-annular aortic valve (Edwards Lifesciences, Irvine, Calif) was implanted. The procedure was uneventful, and the patient was extubated in the intensive care unit.

Figure 1. TEE images (long-axis view) showing the relationship between the mechanical valve prosthesis in mitral position and the aortic annulus before aortic valve implantation (A; white arrow indicates the lack of space between the mitral prosthesis and the aortic annulus) and after percutaneous valve implantation (B; white arrows indicate the aortic and ventricular ends of the percutaneously implanted aortic valve).

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inserted into the left ventricle over the wire. On the basis of an aortic annulus measurement of 23 mm by TEE, a 26-mm Edwards SAPIEN valve (Edwards Lifesciences Inc, Irvine, Calif) was selected for implantation. Careful positioning of the valve with TEE guidance was performed with about half of the valve positioned above and half below the aortic annulus. Valve implantation was performed under rapid pacing, and after valve deployment, TEE showed the appropriate position of the aortic valve, with no interference with the mitral prosthesis (Figure 1B). Three-dimensional computed tomography images of the mitral and aortic prostheses are shown in Figure 2 and Movies I and II. Doppler echocardiography at hospital discharge 6 days after the intervention showed a mean residual aortic gradient and aortic valve area of 12 mm Hg and 1.46 cm², respectively, and the absence of any detectable residual aortic regurgitation. At 2-month follow-up, the patient was in New York Heart Association functional class II, and transthoracic Doppler echocardiography showed the correct position of the valve and the absence of hemodynamic changes compared with the data obtained at hospital discharge. Fluoroscopy images of the aortic and mitral prostheses obtained at 2-month follow-up are shown in Figure 3 and Movies III and IV.

This is the first report of PAVI in the presence of a mechanical heart valve in mitral position. The presence of a mechanical valve in mitral position might complicate PAVI because of (1) the significant reduction or even absence of the mitroaortic space to accommodate the balloon-expanded valve (Figure 1A) and (2) the presence of a mechanical structure instead of fibrous tissue that can limit the expansion.
of the percutaneous valve. Thus, these 2 mechanisms might favor valve underexpansion and embolization. In fact, the presence of previous mitral valve surgery is considered an exclusion criterion in the currently ongoing Placement of AoRTic TraNscatheterER valves (PARTNER) trial (clinicaltrial.org, NCT00530894), which compares PAVI and surgical aortic valve replacement. The present report shows that PAVI can be successfully performed in the presence of mechanical heart prosthesis in mitral position. Importantly, the percutaneous valve was fully expanded, with no deformation of the metallic structure (Figures 2 and 3 and Movies I through IV), only mild residual gradient, and no aortic regurgitation. Moreover, no distortion or malfunction of the mechanical valve in mitral position occurred.

Disclosures
Drs Rodés-Cabau and Dumont are consultants for Edwards Lifesciences Inc. Dr Pibarot has received honoraria from Edwards Lifesciences Inc for speaker’s bureau appointments. All other authors have no conflicts of interest to disclose.

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