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Transcatheter Aortic Valve Implantation into a Stentless Prosthetic Valve with a Low Position of the Left Main Coronary Artery

Giuseppe D'Ancona, MD, PhD, Miralem Pasic, MD, PhD, Stephan Dreysse, MD, Thorsten Drews, MD, Semih Buz, MD, Axel Unbehaun, MD, Marian Kukucka, MD, Roland Hetzer, MD, PhD

Deutsches Herzzentrum Berlin, Berlin, Germany

ABSTRACT

Recently during a transcatheter aortic valve implantation (TAVI), we were faced with a problem that seemed to be untreatable by TAVI. It was difficult to decide whether to perform atypical TAVI or to convert to conventional redo aortic valve surgery in an extremely high-risk patient with a degenerated stentless aortic bioprosthesis.

INTRODUCTION

Transcatheter implantation of an aortic prosthesis into a degenerated stentless bioprosthesis (valve in valve) can be challenging because of the stentless valve design and the adopted surgical-implantation technique.

CASE REPORT

An 86-year-old female patient presented with sudden onset of shortness of breath, fatigue, bilateral pleural effusions, and pedal edema. Nine years before, the patient had undergone both aortic valve replacement with a stentless bioprosthesis (Medtronic Freestyle; Medtronic, Minneapolis, MN, USA) and a single coronary artery venous bypass to the occluded right coronary artery. An echocardiography evaluation showed severe regurgitation of the aortic bioprosthesis with disruption of 1 leaflet. There was also concomitant severe mitral valve insufficiency (Figure 1). A coronary angiography examination showed a patent venous bypass and no progression of coronary artery disease. Aortography and levocardiography examinations were not performed because of the patient's renal insufficiency (serum creatinine, 1.9 mg/dL). Routine preoperative computed tomography was also waived for this reason. The patient's logistic EuroSCORE was 53.9%, and the Society of Thoracic Surgeons score was 13.6%. The patient's clinical status worsened despite conservative therapy. We decided to perform urgent transcatheter "valve-in-valve" aortic valve implantation (TAVI) via

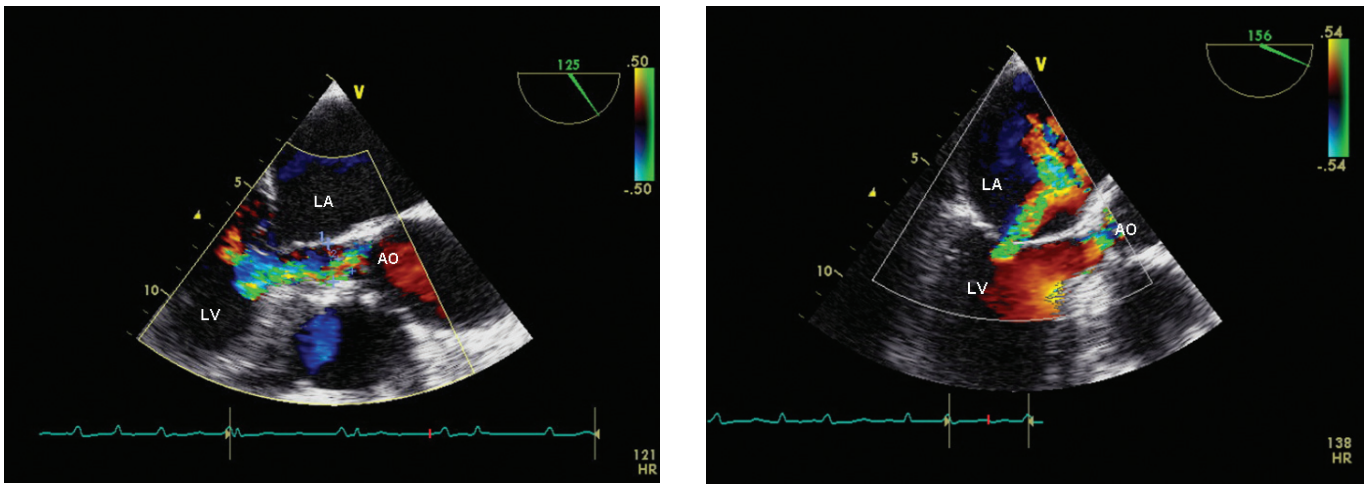

Figure 1. Preoperative transesophageal echocardiography. Left, Image showing an aortic valve regurgitation jet. Right, Image showing a large central regurgitation jet from the mitral valve. LA indicates left atrium; LV, left ventricle; AO, aorta.

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Correspondence: Professor Miralem Pasic, Deutsches Herzzentrum Berlin, Augustenburger Platz 1, D-13353 Berlin, Germany; 49-30-4593-2108; fax: 49-30-4593-2018 (e-mail: pasic@dhzb.de).

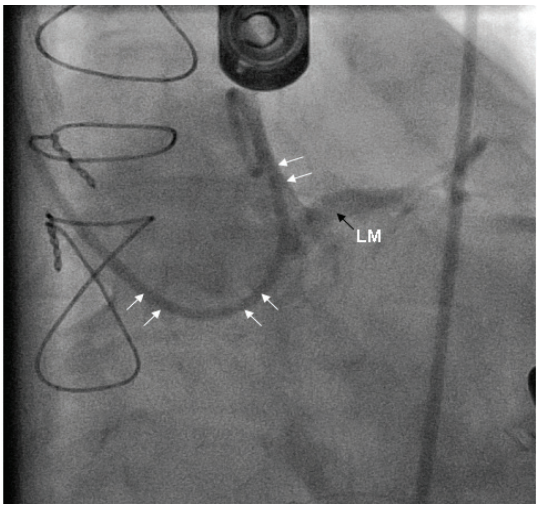

Figure 2. Intraoperative aortography. Note the low origin of the left main coronary artery (LM) (black arrow) in relation to the annulus of the aortic prosthesis; the catheter lies immediately above the annulus (white arrows).

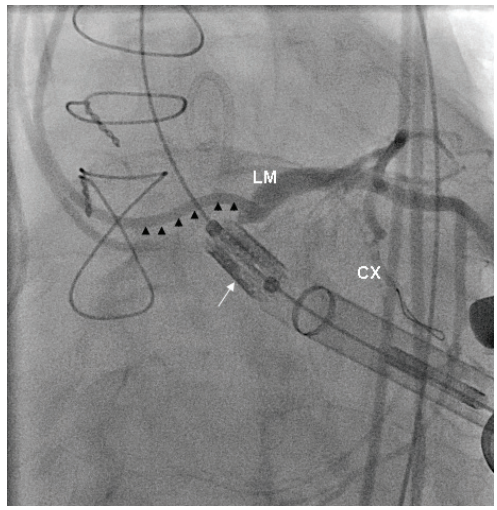

Figure 3. Selective catheterization of the left main coronary artery (LM) and angiography during release of the Edwards Sapien valve (white arrow). Note the support guidewire within the circumflex coronary artery (CX).

transapical access [Kempfert 2010; Drews 2011]. An aortography evaluation performed in the hybrid operating room showed a very low position for the origin of the left main coronary artery (LM) (Figure 2). This finding precluded a standard TAVI because of the inevitable occlusion of the LM if TAVI were to be performed (the occluded right coronary artery already had a patent venous bypass graft). Therefore, we placed a nonocclusive catheter into the ostium of the LM via an intracoronary guidewire anchored in the circumflex artery (Figure 3). The function of the catheter was to serve as a marker of the highest upper reference point for transcatheter valve positioning. In the case of the intraprocedural coronary obstruction, stenting of the LM could have been performed immediately and very quickly. A 23-mm Edwards Sapien valve (Edwards Lifesciences, Irvine, CA, USA) was implanted below the ostium of the LM. Valve deployment was not rapid but was rather slow and gradual, enabling precise correction of the definitive position of the upper (distal) border of the Sapien valve (Figure 4). The definitive position of the deployed valve was significantly lower than usual. It lay mostly below the annulus of the degenerated stentless bioprosthesis. Despite this fact, the position of the new valve in the left ventricular outflow tract was optimal and without interaction with the mitral valve (Figures 5-7). Mitral valve regurgitation decreased immediately to grade 1 (Figure 7). The patient was extubated the next day. Her renal function recovered promptly despite the large amount (325 mL) of contrast medium used during the TAVI procedure. Her postoperative course was uneventful.

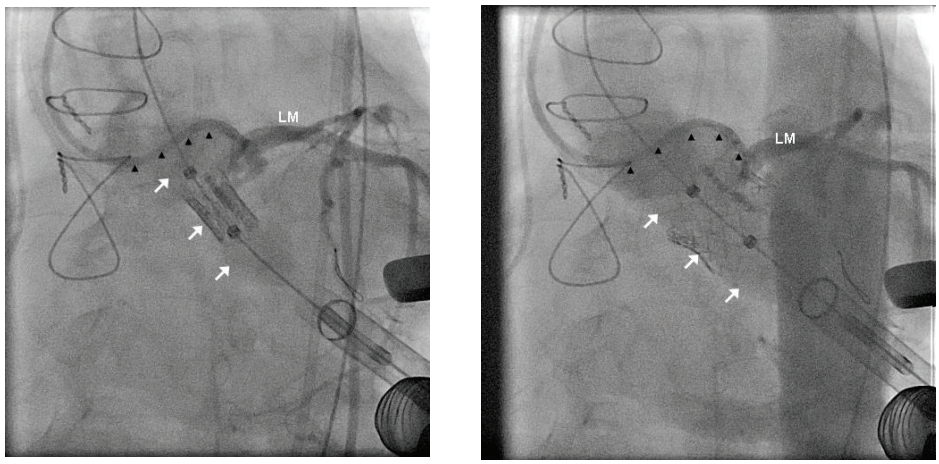

Figure 4. Left, Slow release of the Sapien valve. Note the initial inflation of the balloon and partial dilatation of the valve (white arrows) during the simultaneous catheterization (black arrowheads) of the left main coronary artery (LM). Right, Slow release of the Sapien valve. Note complete inflation of the balloon and full valve dilatation (white arrows) during the simultaneous catheterization (black arrowheads) of the LM.

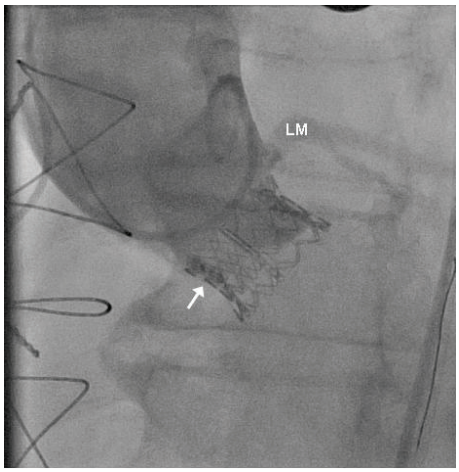

Figure 5. Aortography image immediately after valve release. Note perfect continence of the Edwards Sapien valve, its implantation below the stentless valve annulus (immediately below the catheter), and its position within the left ventricular outflow tract (white arrow).

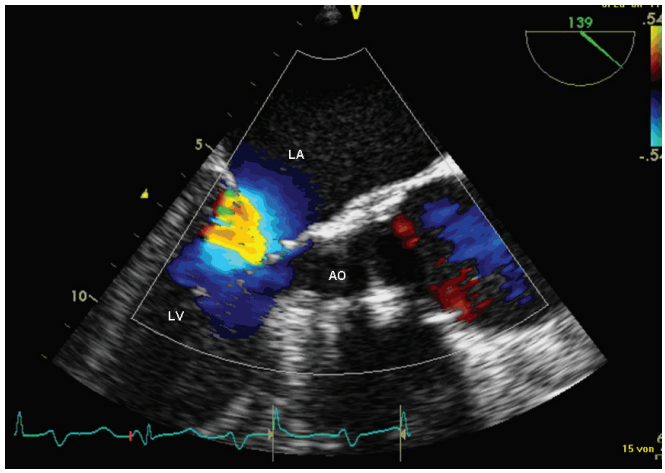

Figure 6. Transesophageal echocardiography after transapical aortic valve implantation. Note perfect aortic valve continence. LA indicates left atrium; LV, left ventricle; AO, aorta.

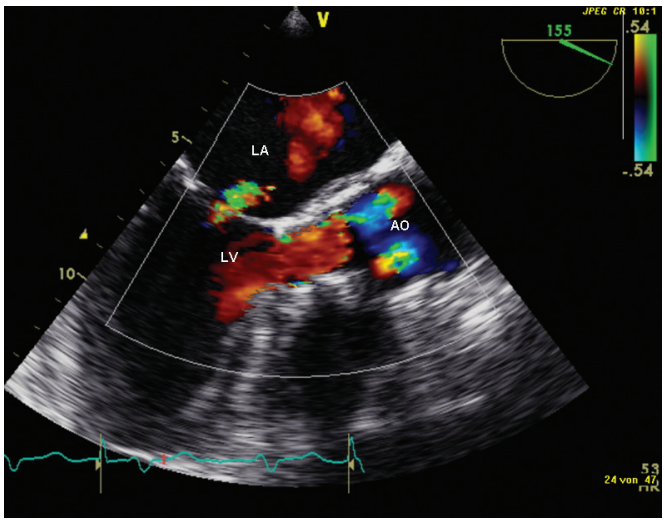

Figure 7. Transesophageal echocardiography evaluation after transapical aortic valve implantation. Note the minimal residual mitral valve regurgitation. LA, left atrium; LV, left ventricle; AO, aorta.

DISCUSSION

Stentless bioprostheses have no prosthetic scaffold and therefore have no radiopaque markers. Both characteristics make implantation of a transcatheter valve into a degenerated stentless bioprosthesis somewhat more difficult. Additionally, the risk for intraprocedural coronary occlusion is increased, because the distance from the coronary ostia to the annulus of the stentless prosthesis is always reduced. The reason is the surgical technique for replacing the aortic valve with a stentless valve in which the valve's annulus always lies above the original position of the native aortic valve annulus [David 1998] (Figure 8).

It seems logical to expect possible derangement of mitral valve function and to question the stability of the transcatheter valve

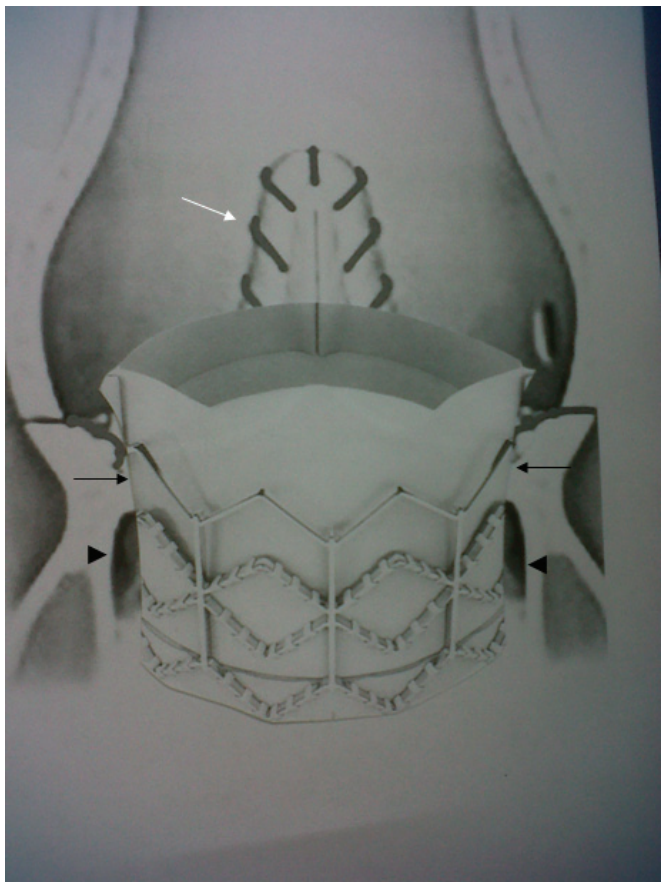

Figure 8. Schematic of the exact location of the Edwards Sapien valve after release. Note that the valve is immediately below the annulus of the stentless prosthesis (white arrow) and that its upper part is within the native aortic valve annulus (black arrows). The lower two thirds of the valve are within the left ventricular outflow tract (black arrowheads).

anchored almost completely within the left ventricular outflow tract. It only seems so, however, because the new valve was positioned too low only in regard to the annulus of the stentless bioprosthetic valve (which had been sutured above the native aortic valve annulus, owing to the particular surgical technique used). In reality, the Sapien valve was anchored in the standard position with respect to the native aortic valve annulus.

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