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Transfemoral Aortic Valve-in-Valve Implantation With a Balloon-Expandable Valve for the Treatment of Stentless Xenograft Severe Aortic Regurgitation

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An 80-year-old woman was admitted with pulmonary edema. She had a history of 2 prior sternotomies: a coronary artery bypass grafting (CABG) plus aortic valve replacement (AVR) with a 23-mm Medtronic-Freestyle (Minneapolis, Minnesota) stentless bioprosthesis 15 years ago, and a redo CABG 10 years ago. Doppler echocardiography showed severe aortic xenograft regurgitation (Figs. 1A and 1B, Online Videos 1, 2, and 3). The patient was considered at very high risk for re-AVR (third sternotomy, STS score: 10.7%, logistical EuroSCORE: 26.3%) and was consequently proposed for transcatheter aortic valve implantation (TAVI), therefore, a valve-in-valve procedure.

The TAVI procedure was performed by the transfemoral approach (1). Based on an aortic annulus measured by transesophageal echocardiography (TEE) of 18.5 mm, a 23-mm Edwards-SAPIEN-XT (Edwards Lifesciences Inc., Irvine, California) was selected for implantation (Figs. 1C to 1E). The major challenge of the procedure was to position the TAV within a stentless (no radio-opaque ring or markers) bioprosthesis; indeed, TEE images were suboptimal to guide valve positioning. The pigtail catheter was therefore placed into the right sinus of Valsalva, and further used as a landmark to position about half of the stent valve prosthesis below and above the points of insertion of the stentless xenograft leaflets as determined by fluoroscopy and angiography (Figs. 2A and 2B, Online Video 4). The TAV was deployed under rapid pacing using a very slow balloon inflation technique that would permit some minor repositioning before full valve prosthesis expansion, and the pigtail catheter was left in place as a positioning marker just until the TAV was about half deployed (Fig. 2C, Online Video 5). Angiographic and TEE images immediately after valve-in-valve implantation showed the appropriate position of the prosthesis without significant transprosthetic gradient, valvular or paravalvular aortic regurgitation (Figs. 2D to 2F, Online Videos 6 and 7). The post-procedural course was uneventful, and the patient was discharged home 3 days after TAVI. Echocardiography at hospital

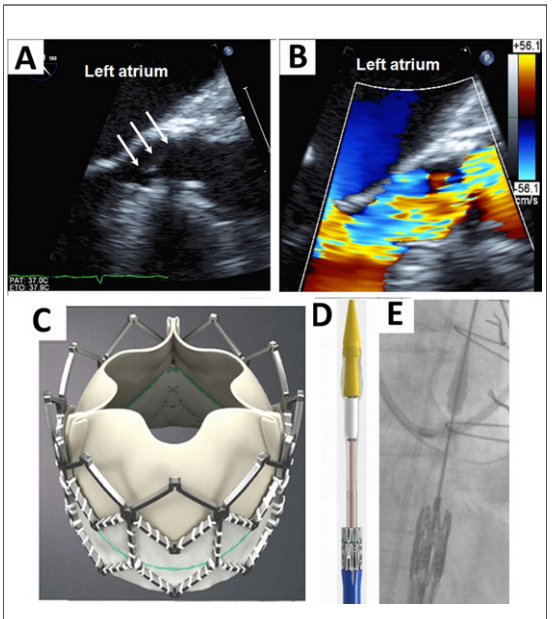

Figure 1. Transesophageal Echocardiography, Balloon-Expandable Valve, and Delivery System

(A–B) Transesophageal echocardiography (long-axis view) images showing complete left coronary leaflet (anatomic) prolapse causing severe aortic xenograft regurgitation. **(C)** The 23-mm Edwards-SAPIEN-XT. **(D)** The 18-F NovaFlex delivery system (Edwards Lifesciences) and **(E)** its fluoroscopic aspect. **Thin arrows (A)** highlight xenograft leaflet prolapse. For a better appreciation, see also the Online Videos 1, 2, and 3.

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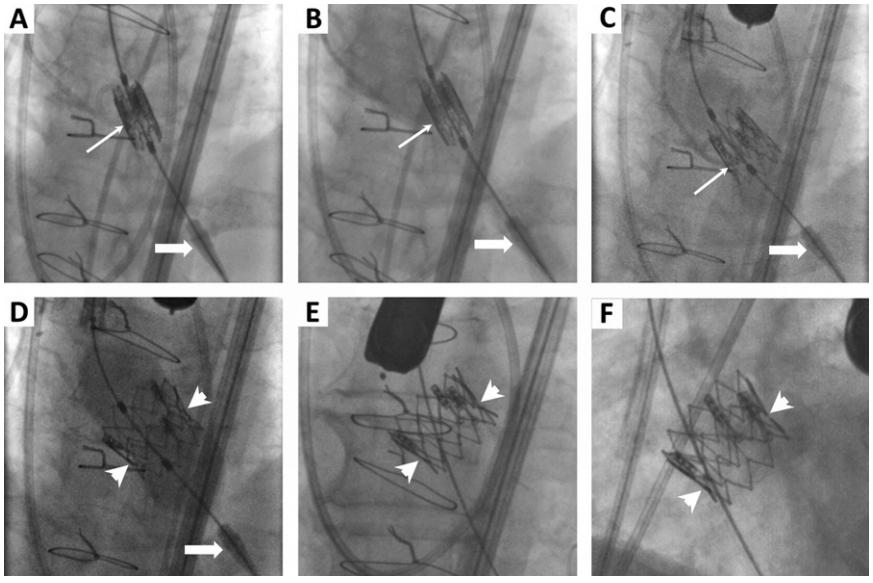

Figure 2. Transcatheter Valve-in-Valve Procedure Using Slow Balloon Inflation Technique

(A) Fluoroscopy showing the pigtail catheter used as a landmark to position the balloon-expandable Edwards-SAPIEN-XT prosthesis within the failed stentless (no radio-opaque markers) xenograft. **(B)** Aortography with the TAV about half below and above the pigtail catheter before valve deployment was considered the optimal position. **(C)** Slow balloon inflation for valve deployment with the pigtail catheter left in place just until the TAV was half-deployed. **(D)** The pigtail catheter was pulled back just before full balloon expansion and valve deployment. Fluoroscopic images immediately after successful transfemoral transcatheter aortic valve-in-valve implantation: **(E)** posteroanterior, **(F)** left anterior oblique. **Thin arrows** highlight the pigtail catheter, **thick arrows** the nose cone of the NovaFlex Delivery System, and **arrowheads** the waist of the Edwards-SAPIEN-XT TAV within the stentless (no radio-opaque markers) xenograft. For better appreciation, see also Online Videos 4, 5, 6, and 7.

discharge showed a residual mean gradient of 13 mm Hg (aortic valve area of 1.43 cm^2). At 4-month follow-up, the patient was in New York Heart Association functional class I.

The transcatheter valve-in-valve technique has opened a new avenue for the treatment of failed xenografts placed in different cardiac positions (2). However, the experience with the transcatheter treatment of dysfunctional stentless aortic valves has been limited to a few cases using the self-expandable CoreValve system (Medtronic) (3,4) or the balloon-expandable Edwards valve implanted by the transapical approach (2). The transapical, as compared with the transfemoral approach, has been suggested as the approach of choice for valve-in-valve cases performed with balloon-expandable valves because of the greater stability provided by a much shorter delivery system and potentially better coaxiality with respect to the aortic annulus (2). This would reduce the potential risks of valve malpositioning or embolization associated with valve-in-valve procedures. Furthermore, although the labeled size of the stentless valve in the present case was 23 mm, TEE measurements showed an aortic-annulus of 18.5 mm, which might have contraindicated the CoreValve system.

The present report shows the feasibility of a transfemoral valve-in-valve procedure using a balloon-expandable valve for the treatment of stentless aortic bioprosthesis dysfunction presenting as severe valvular regurgitation. This case also suggests that the use of an additional marker, such as the pigtail catheter, and a very slow balloon inflation technique might be useful in these cases, especially when TEE images are suboptimal to guide valve positioning and implantation. However, further studies with a larger number of patients are needed to confirm the safety and efficacy of this treatment for patients with stentless valve dysfunction.

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APPENDIX

For accompanying videos, please see the online version of this article.