Minimally invasive transapical aortic valve-in-a-valve implantation for severe aortic regurgitation in a degenerated stentless bioprosthesis

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Transcatheter aortic valve implantation for treatment of patients with severe symptomatic aortic stenosis and high surgical risk has been well described. We report on the first minimally invasive transapical aortic valve-in-a-valve (VinV) implantation for severe aortic regurgitation in a degenerated stentless bioprosthesis (Toronto stentless porcine valve [SPV]; St Jude Medical, Inc, St Paul, Minn) using the Edwards SAPIEN transcatheter heart valve (THV) (Edwards Lifesciences, Irvine, Calif).

Transcatheter aortic valve replacement constitutes a safe, feasible, and effective technique in patients with severe symptomatic aortic stenosis and high surgical risk for conventional aortic valve replacement.¹ Ever since its introduction by Cribier and colleagues,² it has been used to treat degenerative calcific stenosis of the native aortic valve in selected patients.³ Transcatheter aortic valve deployment in failed, surgically implanted, stented aortic bioprostheses has been described with encouraging initial results.^{4,5} We report on the first transapical transcatheter VinV procedure for the treatment of severe aortic regurgitation in a degenerated stentless bioprosthesis using the Edwards SAPIEN THV.

CLINICAL SUMMARY

An 80-year-old male patient presented with symptomatic (New York Heart Association class IV) aortic stentless xenograft regurgitation 9 years after aortic valve replacement with a 25-mm Toronto SPV. Medical history was significant for hypertension and chronic obstructive pulmonary disease.

Transesophageal echocardiography evaluation revealed a bioprosthetic aortic valve with severe aortic valve regurgitation (pressure half-time = 197 ms) (Figure 1, A). There was moderate mitral and tricuspid valve regurgitation with systolic pulmonary artery pressure of 65 mm Hg and severe left ventricular hypertrophy with preserved systolic function (ejection fraction, 50%). Coronary angiography showed a nonobstructive lesion in the proximal left anterior descending artery. Computed tomography angiographic assessment

FIGURE 1. A, Preoperative transesophageal echocardiography: Mid-esophageal long-axis view showing severe regurgitation of the aortic bioprosthesis. LA, Left atrium; LV, left ventricle; Ao, aorta. B, Postoperative transesophageal echocardiography: Mid-esophageal long-axis view showing normal function of the Edwards SAPIEN THV (Edwards Lifesciences, Irvine, CA).

of the entire aorta demonstrated severe atheroma in the ascending aorta and proximal aortic arch.

Logistic European System for Cardiac Operative Risk Evaluation predicted risk for death was 37.3%, and the Society of Thoracic Surgeons risk assessment was 27.5%. The patient was then considered for transapical transcatheter aortic valve implantation because of the increased perioperative risk, although logistic European System for Cardiac Operative Risk Evaluation may overestimate mortality in high-risk patients undergoing isolated aortic valve replacement.

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FIGURE 2. A, Valve positioning. B, Valve deployment. C, Final result.

Valve size selection was done according to the routine echocardiography findings: left ventricular outflow tract measured at transthoracic echocardiogram long-axis mid-esophageal view, in zoom mode, from the hinge points of the noncoronary to the right coronary cusp. The annulus diameter was 19 mm.

The operation was performed in a hybrid operating theater under general anesthesia. After a left anterior mini-thoracotomy and pericardiotomy, 2 apical pursestring sutures (pledgeted 0 Prolene; Ethicon Inc, Somerville, NJ) were placed. After direct puncture of the apex of the heart, a stiff-J guidewire (Amplatz super stiff, 180 cm; Boston Scientific, Natick, Mass) was introduced through the aortic arch down to the descending aorta. During rapid ventricular pacing, at 200 beats/min, adequate dilatation of the degenerated bioprosthesis was achieved with a 20-mm Ascendra aortic balloon valvuloplasty catheter (Edwards Lifesciences). After insertion of the 26F transapical delivery sheath, the VinV implantation of a 23-mm Edwards SAPIEN THV was performed on the beating heart. The valve was successfully deployed and firmly positioned without any migration (Figure 2, A–C). No perivalvular or transvalvular leak was noted, and good hemodynamic function was observed

(Figure 1, B). The patient had an uneventful hospital course and was discharged on postoperative day 7.

At 3 months of follow-up, the patient remained free of symptoms (New York Heart Association I). The echocardiogram showed no peri- or transvalvular leak and preserved functionality of the left ventricle (left ventricular ejection fraction, 60%) with trivial mitral regurgitation.

DISCUSSION

Percutaneous heart valve implantation (Cribier Edwards; Edwards Lifesciences) in the aortic position was performed by Cribier and colleagues in 2002.² The first percutaneous heart valve (CoreValve; CoreValve Inc, Paris, France) procedure for the treatment of a severely insufficient surgically implanted stented bioprosthesis (Mitroflow; Sorin Group, Vancouver, British Columbia, Canada) in the aortic position was reported by Wenaweser and colleagues⁴ in 2007. Subsequently in 2008, Walther and colleagues⁵ reported the transapical VinV implantation of an Edwards Sapien THV inside a stented Edwards Perimount conventional xenograft.

We report, to the best of our knowledge, on the first successful transapical transcatheter VinV procedure to treat

severe regurgitation of an aortic stentless bioprosthesis (Toronto SPV) using the Edwards SAPIEN THV.

CONCLUSIONS

There is a current worldwide trend toward preferential use of biological rather than mechanical aortic prostheses in younger age groups. The expanding applicability of minimally invasive techniques may augment this trend, further lowering the recommended age for tissue aortic valve recipients. The stentless valve design may prove advantageous in case of subsequent VinV therapy. If this proves to be true, it could lead to an increased use of stentless valves. The role of the transcatheter VinV procedure as an alternative to conventional redo aortic valve replacement needs to be determined. Clearly, this technique and platform will play a role in the future, with the parameters

of patient selection and specific surgeon/physician to be defined.

References

1. Vahanian A, Alfieri O, Walther TM, et al. Transcatheter valve implantation for patients with aortic stenosis: a position statement from the European Association of Cardio-Thoracic Surgery (EACTS) and the European Society of Cardiology (ESC), in collaboration with the European Association of Percutaneous Cardiovascular Interventions (EAPCI). *Eur Heart J*. 2008;11:1463-70.
2. Cribier A, Eltchaninoff H, Bash A, et al. Percutaneous transcatheter implantation of an aortic valve prosthesis for calcific aortic stenosis: first human case description. *Circulation*. 2002;106:3006-8.
3. Webb JG, Pasupati S, Humphries K, et al. Percutaneous transarterial aortic valve replacement in selected high-risk patients with aortic stenosis. *Circulation*. 2007;116:755-63.
4. Wenaweser P, Buellesfeld L, Gerckens U, Grube E. Percutaneous aortic valve replacement for severe aortic regurgitation in degenerated bioprosthesis: the first valve in valve procedure using the Corevalve Revalving system. *Catheter Cardiovasc Interv*. 2007;70:760-4.
5. Walther T, Kempfert J, Borger MA, et al. Human minimally invasive off-pump valve-in-a-valve implantation. *Ann Thorac Surg*. 2008;85:1072-3.

“Valve-in-valve” implantation in a patient with stentless bioprosthesis and severe intraprosthetic aortic regurgitation

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An 80-year-old man was admitted to our department for dyspnea (New York Heart Association class III) and angina pectoris. His medical history included an aortic valve replacement (AVR) for aortic stenosis with a size 25 stentless bioprosthesis associated with a coronary bypass (left internal thoracic artery to the left anterior descending coronary artery and saphenous vein to the right coronary artery) in 1999 and a myocardial infarction in 2004. In 2008, infective endocarditis owing to *Streptococcus gallolyticus* was adequately treated by intravenous amoxicillin over 6 weeks, as well as gentamicin for 15 days, and currently was complicated by severe intraprosthetic aortic regurgitation (AR).

On admission, 1 month after complete healing of the endocarditis, blood pressure was 142/43 mm Hg, and clinical signs of severe AR and congestive heart failure were present. Transthoracic and transesophageal echocardiography (TEE)

showed severe intraprosthetic AR owing to perforation and prolapse of the posterior cusp (Figure 1, A), left ventricular dilatation, and preserved left ventricular ejection fraction. Neither vegetations, abscesses, nor paraprosthesis leaks were noted. There were no biological signs of ongoing infection and all blood cultures were negative.

A coronary angiogram showed occlusion of the three native vessels and a patent left internal thoracic graft, but occlusion of the saphenous vein–right coronary bypass. Finally, preoperative computed tomography discovered a limited pulmonary cancer, indicating surgical lobectomy.

The mortality risk was 26% as predicted by the EuroSCORE and 18% according to The Society of Thoracic Surgeons Predicted Risk of Mortality. After multidisciplinary evaluation, transcatheter aortic valve implantation (TAVI) was considered on a compassionate basis to permit thoracic surgery. After informed consent, a 29-mm CoreValve Revalving System (Medtronic, Inc, Minneapolis, Minn) was implanted into the stentless bioprosthesis via percutaneous femoral access using a 10F Prostar XL device (Abbott Vascular, Inc, Abbott Park, Ill) as the pre-closing device. The procedure was performed in the catheterization laboratory, under general anesthesia, with fluoroscopic and TEE guidance. Technical aspects of CoreValve Revalving System implantation have previously been detailed.¹

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