



Successful Surgical Aortic Valve Replacement after Transcatheter Aortic Valve Migration

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Abstract

Transcatheter aortic valves have been designed to treat elderly patients considered high-risk surgical candidates. Transcatheter aortic valve embolization represents a new complication previously unreported in the surgical bioprosthetic valve literature.

We report the case of a 79-year-old male who successfully underwent aortic valve replacement after transcatheter aortic valve dislodgment into left ventricle outflow tract.

Keywords: Aortic valve replacement; Transcatheter valve replacement; Aortic valve; Aortic stenosis

Introduction

Transcatheter heart valves (THV) have been designed to treat elderly patients considered high-risk surgical candidates. The safety and effectiveness of TAVI, in patients affected by severe aortic stenosis, have been demonstrated in numerous observational clinical studies, national registries and also in controlled randomized trial [1,2]. Despite rapidly evolving device technology and growing operator experience, peri-procedural complications are still present. Transcatheter aortic valve embolization represents a new complication previously unreported in the surgical bioprosthetic valve literature [3].

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We describe the case of a sub-acute Direct Flow (Direct Flow Medical Inc., Santa Rosa, CA, USA) dislodgment into left ventricle outflow tract successfully treated with standard aortic valve replacement ten days after TAVI.

Case Presentation

A 79-year-old male (87 kg 170 cm) affected by severe aortic stenosis was admitted to our hospital for increasing dyspnea and angina. The patients had undergone in 1996 coronary artery bypass surgery (CABG) for unstable angina with a left internal mammary graft (LIMA) to left anterior descending artery(LAD) and three saphenous vein grafts on second diagonal, first obtuse marginal branch(OM) and right coronary artery. The patient was also affected by severe chronic renal failure (creatinine clearance 25 ml/min) and carotid vasculopathy. After clinical stabilization patient underwent transthoracic (TTE) and transesophageal echocardiographic evaluation that evidenced a severe aortic stenosis with a mean gradient of 50 mmHg and left ventricle (LV) ejection fraction of 60% and moderate pulmonary hypertension. At coronary angiography chronic total occlusion of proximal LAD, circumflex and right coronary artery was evident, with patent LIMA and saphenous vein grafts. A severe stenosis of posterior interventricular artery was noted. An ECG-gated multislice computer tomography (MSCT) was performed and evidenced a tri-leaflet calcified aortic valve with annulus perimeter of 90.7 mm (24.7 mm x 32.9 mm) and normal peripheral arteries (Figure 1A and B). After Heart Team evaluation taking in consideration patient's age, prior CABG and comorbidities (Euroscore II: 19%; STS score Mortality: 10%) trans-catheter aortic valve implantation was preferred. Three days before TAVI a PCI with drug-eluting stenting of posterior interventricular artery was performed. Taking in consideration annulus size (mean diameter derived from perimeter of 28.8 mm, annulus area of 633 mm²) and anatomy a Direct Flow implantation was preferred.

The procedure was performed, under local anesthesia, in a hybrid OR. A 29 mm Direct Flow bioprostheses was then positioned using the standard implantation technique for the Direct Flow

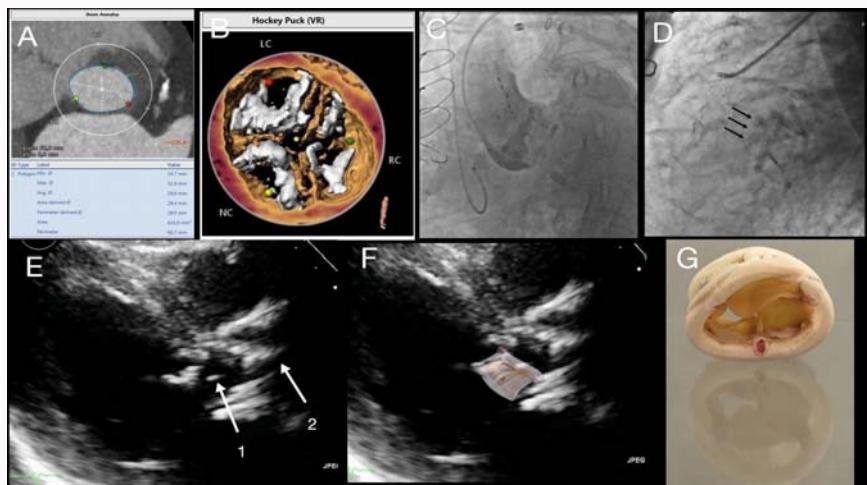


Figure 1: **A)** Double oblique transverse reformat of aortic annulus at ECG-gated multislice computer tomography. **B)** Hockey Puck 3-d gated multislice computer tomography reconstruction with evidence of native aortic valve anatomy and calcifications. **C)** Final aortography evidenced correct positioning of the Direct Flow valve with no paravalvular leak. **D)** coronary angiography on 3rd post-operative day evidenced the presence of the native calcified aortic leaflet (black arrows) above upper ring of the Direct Flow was evident. **E)** Parasternal long-axis 2-dimensional echocardiography evidenced Direct Flow dislodgment into left ventricle outflow tract with only a part of the upper ring inside of aortic annulus. Arrows 1 indicates Direct Flow leaflets, arrow 2 indicates native aortic valve leaflet. **F)** Parasternal long-axis echocardiography view with superimposed Direct Flow valve. **G)** Direct Flow valve after valve removal, from aortic view.

device: the inner curve technique [4]. Correct Direct Flow placement with no para-valvular leak and normal coronary and grafts flow was confirmed (Figure 1C).

Patient had an uneventful hospital course and was discharged from intensive cardiology unit on 1st post-operative day with normal valve function on TTE. On 3rd post-operative day patient experienced recurrent angina despite medical treatment, coronary angiography evidenced normal LIMA and vein grafts function but the presence of the native calcified aortic leaflet above upper ring of the Direct Flow was evident (Figure 1D). At TTE a slight migration of the Direct Flow toward LV outflow tract was evident with 1+ para-valvular leak. Three days after a new 3/6 diastolic murmur was evident, TTE evidenced Direct Flow dislodgment into left ventricle outflow tract with only a part of the upper ring inside of aortic annulus (Figure 1E and F), with 2/3+ aortic regurgitation and mean gradient through native aortic valve of 60 mmHg. After Heart Team evaluation re-do aortic valve replacement was decided, considering recent PCI with the need of dual antiplatelet therapy and patient clinical stability, according to our prior experience a bridge therapy with tirofiban was undertaken [5]. Clopidogrel was withdrawn 5 days before surgery, and tirofiban started 24 h later, continued until 4 h before surgery, and resumed 2 h after surgery until oral clopidogrel was resumed. Patient successfully underwent aortic valve replacement, after aortotomy, dislodgment of Direct Flow was evident and valve easily removed, implantation of a Carpentier-Edwards Perimount 21 Magna (Edwards Life sciences, Irvine, CA, USA) was performed. Patient had an uneventful hospital course and discharged on 8th post-operative day.

Transcatheter aortic valve implantation has now become the standard of care for patients with symptomatic severe aortic stenosis who are considered at high risk for surgery [1,2]. With increasing numbers of cases, various procedural complications have been identified, trans-catheter valve embolization represents a new complication, previously unreported in the surgical bioprosthetic valve literature. Most cases occurred during the procedure or immediately after implantation, as reported in the review article by Ibebuogu and coll [6]. Conversion to open-heart surgery required for

valve retrieval and replacement was associated with a 30-day mortality rate of 17%. In the review paper by Mylotte and coll [3], eighteen cases of late THV embolization were collected, 15 after Edwards SAPIEN (Edwards Life sciences, Irvine, CA, USA) implantation and 3 after Medtronic Core Valve (Medtronic Inc, Minneapolis, MN, USA). On average, late THV embolization occurred 43 days (range: 4 h to 370 days) after the index procedure. Valve embolization was retrograde into the left ventricular outflow tract in the majority of the cases and clinical presentation was usually hemodynamic destabilization. Subsequent surgical intervention was performed in 14 patients, with survival to hospital discharge noted in 62% of cases. In our case a second generation device was implanted, the Direct Flow THV; this is the first aortic transcatheter valve device that is not based on a metallic frame technology [7]. Several patient and procedural factors may predispose to late THV embolization, such as: under-sizing or under-expansion of the valve, low implantation of the device, sparsely calcified native anatomy providing insufficient THV anchoring or asymmetric aortic root calcification [3,6]. In our case the mechanisms responsible for downward THV migration could include native leaflet overhang post deployment, and bulky calcification on the right coronary cusp, extending to above 15mm, both exerting downward force on the THV. Aortic valves are subjected to ante grade ejection forces during systole and retrograde forces during diastole, the retrograde force on a closed valve has been shown to be 10 times the ante grade force [8]. Probably an echocardiographic control before polymer exchange should be useful to evaluate appropriate Direct Flow positioning. Our experience characterized by a heart team approach and multidisciplinary patient care was essential for patient care, not only during TAVI, but it was utmost important in managing patient complication and choosing correct surgical timing.

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