International Journal of Cardiology 167 (2013) e172–e174

Contents lists available at ScienceDirect

International Journal of Cardiology

journal homepage: www.elsevier.com/locate/ijcard

Letter to the Editor

Direct-aortic "evolute" self-expanding aortic bioprosthesis implantation

Giuseppe Bruschi [a,*], Federico De Marco [a], Alberto Barosi [a], Luca Botta [a], Paola Colombo [a], Emanuela Montorsi [b], Silvio Klugmann [a], Luigi Martinelli [a]

[a] "A. De Gasperis" Cardiology & Cardiac Surgery Department, Niguarda Ca' Granda Hospital, Milan, Italy
[b] Cardiothoracic Anesthesia and Intensive-care, Niguarda Ca' Granda Hospital, Milan, Italy

ARTICLE INFO

Article history:
Received 8 April 2013
Accepted 12 April 2013
Available online 9 May 2013

Keywords:
Aortic stenosis
Transcatheter valve implantation
Aortic valve
Thoracotomy
Prior cardiac surgery

Transcatheter aortic valve implantation (TAVI) has been designed to treat high-risk for surgery patients affected by severe aortic stenosis. Concerns exist about treating patients who previously underwent mitral valve surgery for possible interference between the percutaneous aortic valve and the mitral prosthesis. TAVI procedure may be performed from the femoral artery [1,2] from a transapical approach [3] or the axillary artery [4] and has rapidly gained credibility. Because of the large device size of current generation systems, the trans-femoral approach requires favorable ileo-femoral arterial anatomy. To treat these patients a trans-subclavian approach or transapical access is generally preferred. In last year transcatheter valve implantation has been described via a direct ascending aorta approached and standard retrograde valve deployment in patients with contraindications to the femoral or subclavian approach [5,6]. In the present paper we report, to our knowledge, the first case of direct aortic Medtronic Evolute 23 mm valve (Medtronic Inc., MN, USA) implantation in an 84 year-old female with a mechanical mitral prosthesis.

The patient is an 84 year-old lady (160 cm, 65 kg) affected by hypertension, dyslipidemia, severe renal failure (creatinine clearance 30 ml/min) and chronic atrial fibrillation. She underwent mitral commissurotomy in 1980 followed 20 years after by mitral valve replacement with a Sorin bicarbon 25 mm (Sorin Biomedical Cardio, Saluggia VC, Italy) and tricuspid repair; the bicarbon prosthesis has the peculiar characteristic feature of curved pyrolytic carbon leaflets with a rigid titanium carbofilm coated housing. The patient underwent percutaneous coronary intervention on the left anterior descending artery in 2002. She experienced a transient ischemic attack in 2006. Since 2010 the patient experienced severe bleeding due to angiodysplasia of the colon treated with multiple transfusions followed by sigma resection complicated by bladder-colon fistula. The patient was admitted to our hospital for pulmonary edema and a severe aortic stenosis was diagnosed with a mean gradient of 53 mm Hg and moderate aortic regurgitation, normal mitral prosthesis function with mean gradient of 7 mm Hg, normal left ventricle function and pulmonary hypertension 62 mm Hg. She underwent aortic–iliac–femoral, chest and coronary computerized tomography scan (CT) with evidence of normal coronary arteries with patent stent, small size femoral arteries <5 cm, and small size annulus (22 × 17 mm, perimeter 62.6 mm). After heart team evaluation, considering prior cardiac surgery patient's age and comorbidities (Euroscore II: 14.64%; Euroscore Logistic 55.92%; STS score Mortality: 11.69%) a transcatheter aortic valve implantation was preferred through a direct-aortic approach, and patient's written informed consent was obtained. A Medtronic Evolut 23 mm valve was preferred considering annulus size.

The Evolute valve is a new CoreValve designed valve tailored to reduce overall height to 45 mm that incorporates technology that optimizes fit, thereby promoting sealing between the prosthetic valve and the native valve. The Evolut valve is treated with alpha-amino oleic acid (AOA). AOA binds to aldehyde groups within the pericardial tissue and, thus, inhibits calcification of the prosthetic valve leaflets [7]. Using CT scan and 3-d echocardiogram (Echo) we evaluate the distance between the aortic annulus and mitral prosthesis that was 5.5 mm (Fig. 1). The procedures were performed by the cardiovascular team composed of interventional cardiologists, cardiac surgeons with expertise in hybrid procedures, and cardiac anesthesiologists in a hybrid room. We performed the procedure through a right anterior mini-thoracotomy with a 5 cm incision in the second intercostal space; details about the procedure have been previously described [8]. A basal ascending aorta aortography was performed to measure the distance between the aortic annulus and the selected entry site in the ascending aorta, and to obtain a coaxial trajectory between entry site and annulus (Fig. 2A). After standard balloon aortic valvuloplasty with a Nucleus 18 mm balloon (NuMED, Inc. Hopkinton, NY USA) under rapid, an Evolut 23 mm bio-prosthesis was then carefully introduced and retrogradely implanted under angiographic and fluoroscopic guidance (Fig. 2B) over the super stiff wire with immediate improvement of the hemodynamic status (pick-to-pick hemodynamic gradient 7 mm Hg, AR). Final ascending aorta angiography evidenced normal ascending aorta and no para-valvular leak. No interference within the

* Corresponding author at: "A. De Gasperis" Cardiology & Cardiac Surgery Department, Niguarda Ca' Granda Hospital, Piazza dell'Ospedale Maggiore 3, 20162 Milan, Italy. Tel.: +39 02 6444 2565.
E-mail address: giuseppe.bruschi@fastwebnet.it (G. Bruschi).

0167-5273/$ – see front matter
http://dx.doi.org/10.1016/j.ijcard.2013.04.155

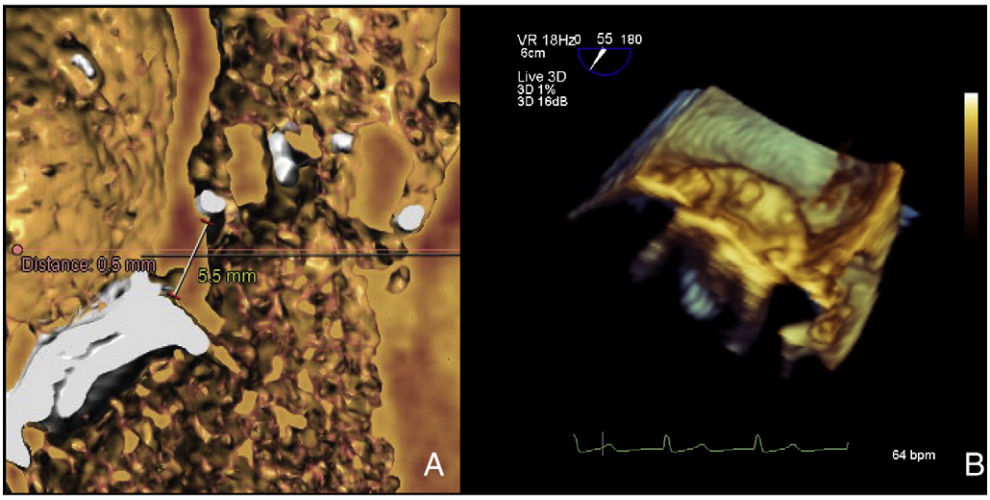

Fig. 1. Multislice cardiac computed tomography (A) and 3D echocardiographic reconstruction (B) showing the distance between the aortic annulus and the mitral valve housing.

Evolut nitinol tube and the bi-leaflet valve was noted after full valve deployment, with normal mechanical prosthesis function (Fig. 2) and normal aortic valve function with mean gradient of 10 mm Hg at Echo. Patient was extubated soon after the procedure, admitted to coronary ICU and discharged from hospital on the 10th post-operative day.

In the last ten years, since first TAVI was done via the femoral vein with an antegrade (trans-septal) access, several different approaches have been applied, such as the retrograde approach via femoral arteries [1,2], the anterograde transapical approach via a left mini-thoracotomy [3], or the subclavian approach [4]. More recently other proximal alternative proximal access has been proposed a carotid artery access [9] and a direct aortic approach either via an upper mini-sternotomy [5] or right anterior mini-thoracotomy [8]. All approaches have different advantages and limitations, vascular complications are frequent and currently still reported in up to 32% of percutaneous trans-femoral TAVI cases [10] necessitating endovascular or surgical treatment with an impact on short and long term survival. Transapical valve implantation has an incidence of bleeding from the apical puncture site requiring surgical repair and possible accidental damage of a coronary artery; it also has peculiar potential and unique long term complications such as the development of left ventricular apical false aneurysm, arrhythmias and echocardiographic hypokinesia or akinesia [3]. A trans-subclavian retrograde approach could represent an alternative in patients with coexistent severe iliac–femoral arteriopathy, considering that the axillary artery is easily accessible and that the procedure should be performed with local anesthetic and mild sedation [4]. However the axillary is a fragile artery and patients are not eligible for the subclavian approach in case of vessel diameter <6 mm. Moreover the subclavian approach has to be considered cautiously in patients with patent left internal mammary artery graft. In this scenario a direct aortic approach could represent an intriguing alternative access [5,6]. The advantage of TAVI through a right anterior mini-thoracotomy is more evident in re-do patients, in whom a repeat sternotomy, even if partial, is a challenging procedure; indeed, right thoracotomy requires only limited dissection at the entry site on the ascending aorta. Moreover through a direct aortic access a high valve deployment control is obtained, with one-to-one

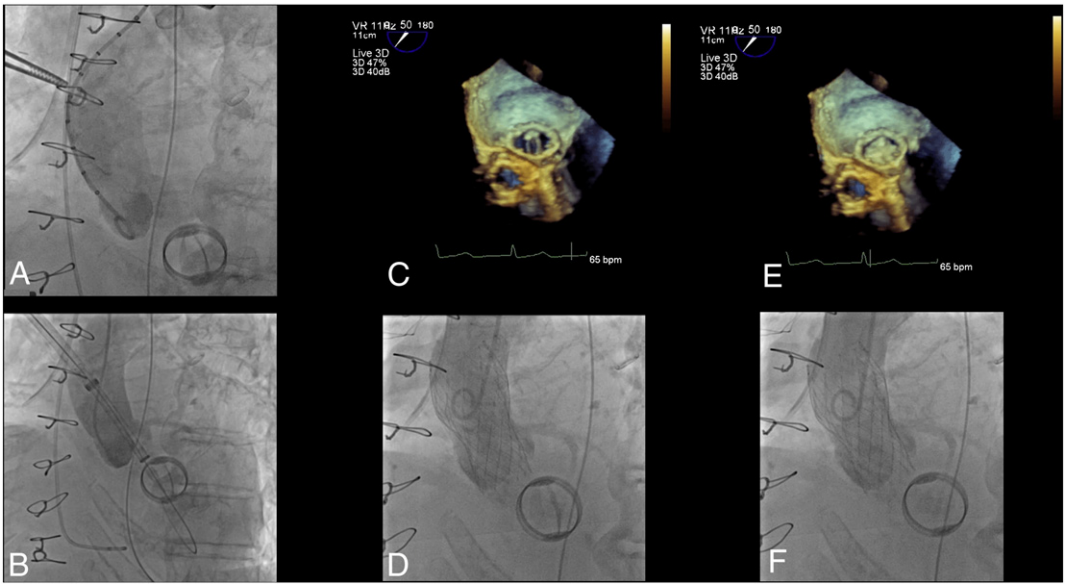

Fig. 2. Basal ascending aorta aortography to measure the distance between the aortic annulus and the selected entry site in the ascending aorta, and to obtain a coaxial trajectory between entry site and annulus (A). Evolut 23 mm bio-prosthesis retrograde implantation. Fully expanded Evolut prosthesis across the native aortic valve, aortogram demonstrates good opacification of the left main and anterior descending artery, no evidence of aortic regurgitation and no interference neither distortion of the CoreValve nitinol tube nor malfunction of the bi-leaflet mechanical valve with full leaflet opening and closure during diastole and systole evaluated by echocardiography (C, E) and fluoroscopy (D, F).

force transmission, determining an accurate valve implantation, fundamental in our case to avoid any interaction with the mitral prosthesis.

References

[1] Webb JG, Chandavimol M, Thompson C, et al. Percutaneous aortic valve implantation retrograde from the femoral artery. Circulation 2006;113:842–50.

[2] Grube E, Buellesfeld L, Mueller R, et al. Progress and current status of percutaneous aortic valve replacement: results of three device generations of the CoreValve Revalving system. Circ Cardiovasc Interv 2008;1:167–75.

[3] Ye J, Cheung A, Lichtenstein SV, et al. Transapical aortic valve implantation in humans. J Thorac Cardiovasc Surg 2006;131:1194–6.

[4] Petronio AS, De Carlo M, Bedogni F, et al. Safety and efficacy of the subclavian approach for transcatheter aortic valve implantation with the CoreValve revalving system. Circ Cardiovasc Interv 2010;3(4):359–66.

[5] Bauernschmitt R, Schreiber C, Bleiziffer S, et al. Transcatheter aortic valve implantation through the ascending aorta: an alternative option for no-access patients. Heart Surg Forum 2009;12:e63–4.

[6] Bruschi G, De Marco F, Fratto P, et al. Direct aortic access through right minithoracotomy for implantation of self-expanding aortic bioprosthetic valves. J Thorac Cardiovasc Surg 2010;140:715–7.

[7] Sinning JM, Werner N, Nickenig G, Grube E. Medtronic CoreValve Evolut valve. EuroIntervention 2012;8:Q94–6.

[8] Bruschi G, De Marco F, Botta L, et al. Direct aortic access for transcatheter self-expanding aortic bioprosthetic valves implantation. Ann Thorac Surg 2012;94:497–503.

[9] Modine T, Sudre A, Delhaye C, et al. Transcutaneous aortic valve implantation using the left carotid access: feasibility and early clinical outcomes. Ann Thorac Surg 2012 May;93:1489–94.

[10] Kahlert P, Al-Rashid F, Weber M, et al. Vascular access site complications after percutaneous transfemoral aortic valve implantation. Herz 2009;34:398–408.