

Direct Aortic CoreValve implantation via right anterior thoracotomy in a patient with patent bilateral mammary artery grafts and aortic arch chronic dissection

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Abstract

Direct aortic trans-catheter aortic valve implantation is an alternative approach to treat high risk for surgery patients affected by severe aortic stenosis and concomitant peripheral vascular disease.

We describe a case of direct aortic CoreValve implantation made via a right anterior thoracotomy in a 78-year-old male affected by severe aortic stenosis and severe peripheral vasculopathy, who previously underwent coronary artery bypass grafting, with patent bilateral mammary artery grafts and chronic aortic arch dissection.

Key words: Aortic stenosis; Transcatheter Valve Replacement; Direct Aortic; Aortic Valve

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Introduction

Transcatheter aortic valve implantation (TAVI) is widely used to treat patients with aortic stenosis who are at increased risk for surgical aortic valve replacement due to multiple comorbidities. Numerous observational clinical studies, national registries¹ and controlled randomized clinical trials^{2,3} demonstrated the safety and effectiveness of transcatheter valve implantation. The first access for TAVI was the retrograde approach from the femoral artery, today several choices for access route are available, the subclavian access⁴, the transapical or direct aortic approaches^{5,6,7}.

Direct aortic trans-catheter aortic valve implantation should be performed via a mini-sternotomy or right thoracotomy, in both cases in patients with patent bilateral mammary artery grafts the procedure should be considered more challenging and careful computed tomography evaluation is needed.

We describe the case of a 78 year-old male that underwent retrograde CoreValve direct aortic implantation after two coronary artery bypass grafting operations with bilateral mammary artery grafts and chronic aortic arch dissection. A 78 year-old male (165 cm, 110 Kg) affected by severe aortic stenosis was admitted to our hospital. The patient was affected by severe renal failure, peripheral vascular disease, and severe chronic obstructive pulmonary disease. The patient had previously undergone emergency coronary artery bypass grafting (CABG) in 1993 with saphenous vein grafts. He subsequently underwent eleven different percutaneous coronary interventions (PCIs) on native coronary arteries and saphenous vein grafts. In 2005 the patient underwent re-do emergency

CABG with bilateral mammary arteries graft and saphenous vein grafts and subsequently other two PCIs. Echocardiographic evaluation evidenced a severe aortic stenosis with a mean gradient of 45 mmHg; at coronary angiography mammary artery grafts were patent. An ECG-gated multi slices computed tomography (MSCT) was performed and evidenced chronic dissection of aortic arch with extension to the brachiocephalic trunk and left subclavian artery (Figure 1 A). After Heart Team evaluation taking in consideration patient's prior CABG and comorbidities (Euroscore II: 37.2%; STS score Mortality: 25%) a TAVI was preferred, patient's written informed consent was obtained. Due to chronic aortic arch dissection and peripheral vasculopathy, a direct aortic access was chosen. On the basis of 3-d CT scan images right mammary artery course was evaluated, entry site on the ascending aorta was selected and right anterior thoracotomy was preferred (Figure 1 B, C), a Medtronic CoreValve 29 mm valve was preferred considering annulus size.

The procedure was performed, under general anesthesia, in a hybrid OR by our heart team. A temporary pacing lead was advanced in the right ventricle through the right femoral vein. A right radial access was performed in order to inject directly the right mammary artery and a femoral access was gained to advance a pigtail catheter in the non-coronary cusp. Right anterior thoracotomy was performed in the 2nd intercostal space as evaluated by MSCT, mammary artery graft course was visualized by contrast injection (Figure 1 D). A basal ascending aorta aortography was performed to evaluate location of proximal graft anastomosis before opening the pericardium and to measure the distance between the aortic annulus and

**Figure 1**

Panel A: Pre-procedure computed tomography evidence aortic arch chronic dissection with extension to the brachiocephalic trunk and left subclavian artery.

Panel B: Right mammary artery course and entry site on ascending aorta was evaluated on 3-d computed tomography reconstruction

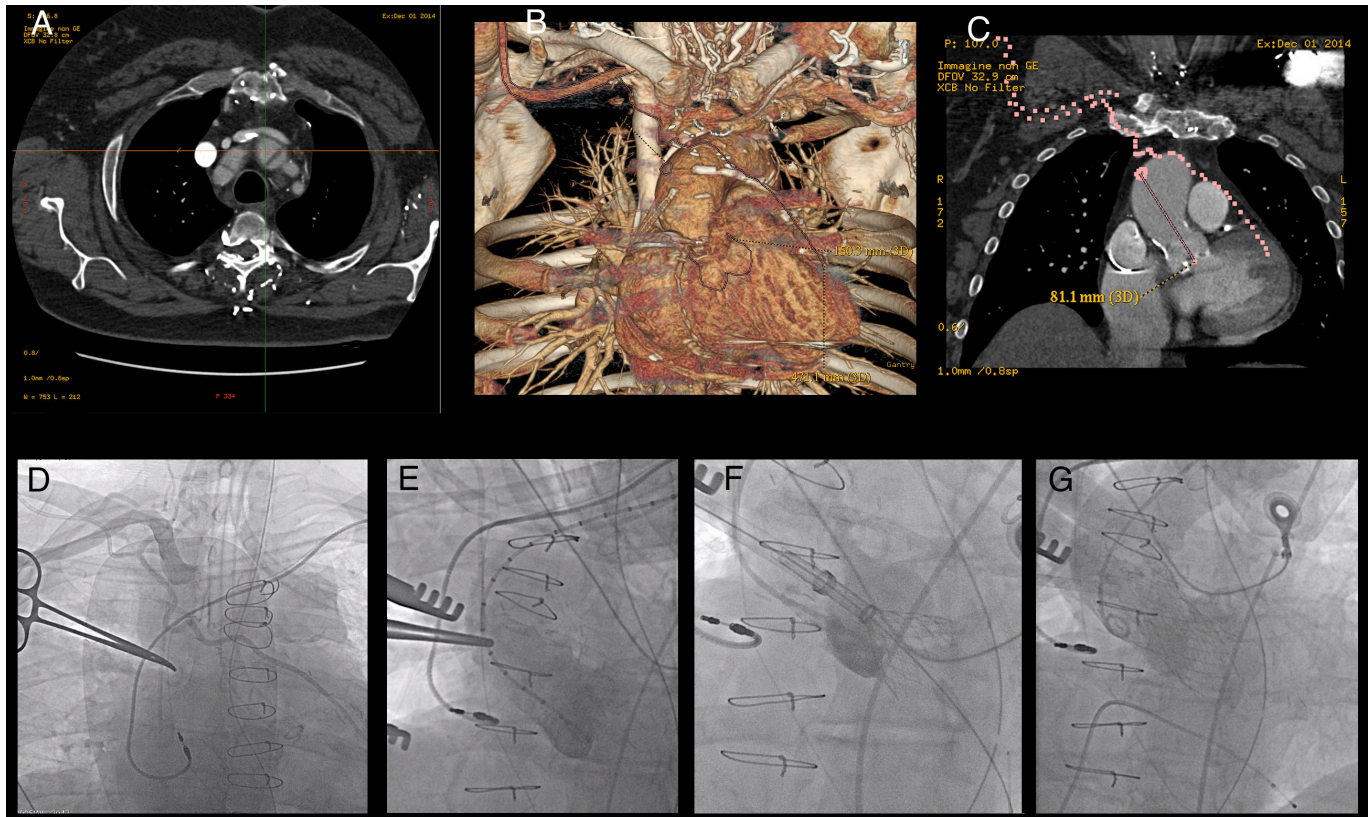
Panel C: Coaxial alignment of entry site and distance from aortic annulus was confirmed on the basis of computed tomography.

Panel D: Angiography during implantation was made from right radial artery to confirm the course of right mammary artery and to evaluate the distance from entry site on the ascending aorta.

Panel E: Basal Aortography was performed to confirm implant projection and to evaluate the distance and coaxial trajectory between aortic annulus and entry site.

Panel F: Direct aortic CoreValve retrograde implantation

Panel G: Final aortography confirmed normal CoreValve function with trivial aortic regurgitation, patent coronary artery and saphenous graft.



the selected entry site, and evaluate coaxial trajectory to aortic annulus (Figure 1 E). Direct aortic cannulation was performed with the Seldinger technique through double purse-string sutures, the technique as been previously described^{5,6}. A 29 mm CoreValve was then carefully introduced and retrogradely implanted under angiographic and fluoroscopic guidance (Figure 1 F). Final ascending aorta angiography evidenced normal ascending aorta and trivial para-valvular leak (Figure 1 G); hemodynamics evaluation evidenced mean gradient of 5 mmHg. Patient was extubated on first post-operative day, and discharged from hospital on 10th post-operative day.

The direct aortic approach is currently CE mark approved as an alternative to the trans-femoral for the CoreValve and Edwards TAVI^{4,6}. The choice of mini-sternotomy or right thoracotomy to access the aorta is typically driven by the anatomical or clinical characteristics of the patient, with the sternotomy most often used when the aorta is positioned midline or to the left, and the right thoracotomy selected for patients having an aorta which deviates right of midline or have patent bypass grafts⁸. In both cases in patients with patent bilateral mammary artery grafts the procedure should be considered more challenging and careful computed tomography evaluation is essential. In our case DA via a right thoracotomy was considered the safest access taking in consideration both peripheral vasculopathy and aortic arch chronic dissection.

Our experience demonstrated the safety and feasibility of direct aortic approach for TAVI, even in presence of bilateral mammary artery grafts, and highlights the key role of MSCT scan for pre-procedural planning.

Statement of ethical publishing

The authors state that they abide by the statement of ethical publishing of the International Cardiovascular Forum Journal⁹.

Conflict of interest:

There is no conflict of interest for any of the authors.

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