Interactive CardioVascular and Thoracic Surgery 23 (2016) 674–676
doi:10.1093/icvts/ivw180 Advance Access publication 31 May 2016

Cite this article as: Pocar M, Tavano D, Passolunghi D, Airoldi F. Transcatheter CoreValve implantation for aortic regurgitation in a Jehovah's witness with prior aortic dissection. Interact CardioVasc Thorac Surg 2016;23:674–6.

Transcatheter CoreValve implantation for aortic regurgitation in a Jehovah's witness with prior aortic dissection

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Received 9 March 2016; received in revised form 19 April 2016; accepted 2 May 2016

Abstract

Indications for transcatheter valve implantation have been extended to treat native valve aortic regurgitation in case of disproportionate risk for open surgery. Transcatheter aortic valves are also an attractive alternative in patients who refuse blood transfusions. We report the successful off-label implantation of a self-expandable transcatheter valve in a Jehovah's Witness with prior replacement of the ascending aorta for Type A dissection, residual severe aortic regurgitation and refractory heart failure.

Keywords: Perioperative issues and risk analysis • Great vessels • Minimally invasive surgery • Transcatheter valve therapy • Valve disease • Thoracic aorta

INTRODUCTION

Indications for transcatheter aortic valve implantation (TAVI) device have been extended to treat pure native valve aortic regurgitation (AR) in patients judged at high or extreme risk for open heart surgery [1, 2]. Off-label indications for TAVI in AR also include patients with a history of Type A aortic dissection repair. In parallel, TAVI represents an attractive alternative in patients who refuse blood transfusions, and has been anecdotally reported in Jehovah's Witnesses (JWs) with aortic stenosis [3, 4]. We report the successful transcatheter implantation of a self-expandable valve to treat AR in a JW with previous graft replacement of the supracoronary ascending aorta for acute dissection.

CASE REPORT

A 78-year old female JW with hypertension, dyslipidaemia and obesity had undergone emergency Type A acute aortic dissection repair 4 years earlier. The previous life-saving operation consisted of culprit replacement of the supracoronary ascending aorta with a short 30-mm dacron graft, employing standard cardioplegia with aortic cross-clamping, but avoiding hypothermic circulatory arrest to minimize the risks of severe anaemia. The aortic root had been preserved and valve commissures resuspended. The patient survived without transfusions and recovered free of complications. Four years thereafter, however, she presented with severe AR and refractory heart failure, with two hospitalizations in 4 months. The risk of an open reoperation to replace the aortic valve without written consent for blood transfusion was judged prohibitive, and TAVI with a CoreValve® (Medtronic, Inc., Minneapolis, MN, USA) was considered by the heart team.

Angiography and computed tomography outlined normal coronary arteries and the absence of aortic calcifications (Fig. 1). The aortic annular diameter measured 26 mm, whereas the arch and thoracoabdominal aorta were near normal. Preprocedural 3D virtual valve simulation was undertaken with Osirix post-processing software (Pixmeo, Geneva, Switzerland) to determine optimal sizing for adequate sealing in the aortic annulus and prosthetic supracoronary aorta, taking into account the inflow and outflow diameters and radial forces of the CoreValve's frame. Ultimately, a 29-mm valve with 20% oversizing was chosen for implantation, targeting the device's proximal end 6 mm below the annular plane to minimize valve embolization hazards (Fig. 2, Video 1). The procedure was carried out under general anaesthesia with surgical cut-down of the left common femoral artery, avoiding the previously cannulated right femoral artery to minimize bleeding hazards. No conduction disturbance occurred despite a slightly caudal implantation. The following course was uneventful and the patient was discharged on postoperative day 6. At 18-months follow-up, the patient is in New York Heart Association functional class I with normal CoreValve function at echocardiography.

DISCUSSION

Surgical valve replacement represents the standard of care for the treatment of severe aortic valve disease. TAVI has become a therapeutic option for patients with calcific aortic valve stenosis judged

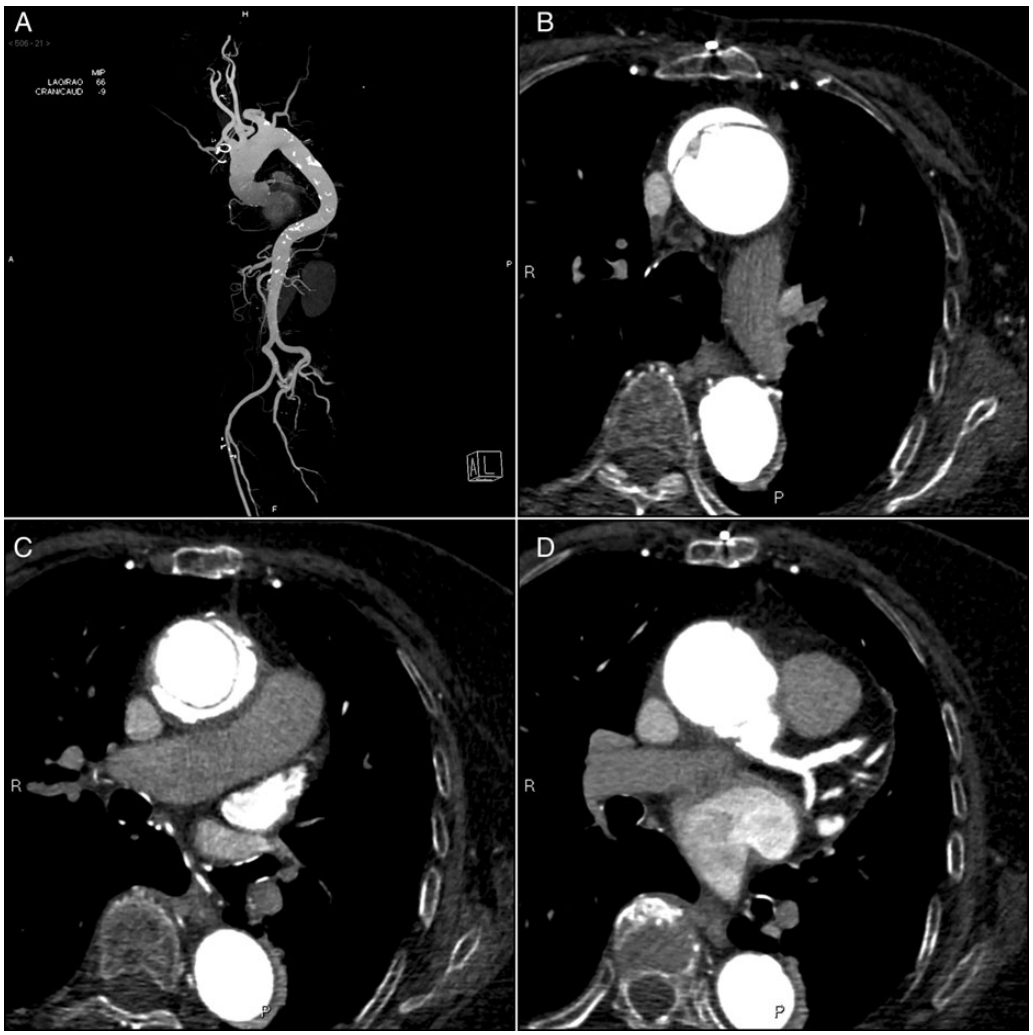


Figure 1: 3D computed tomographic angiography. (**A**) Mild tortuousity of the aorta and supra-aortic trunks, and absence of aortic calcifications proximal to the left subclavian artery origin. (**B**) Partial dissection of the distal ascending aorta. (**C**) Residual chronic aortic root dissection. (**D**) Absence of left main coronary artery obstruction.

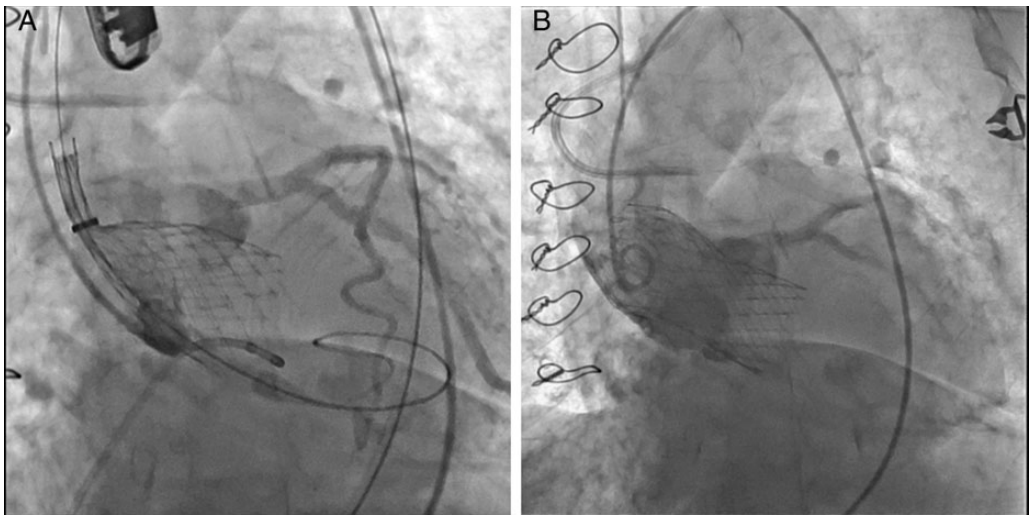
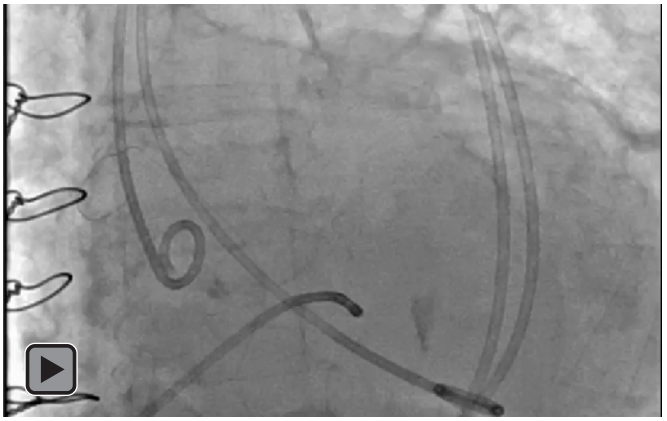


Figure 2: Aortograms. (**A**) No migration after release of the proximal two-thirds of the CoreValve, despite severe aortic regurgitation and no annular calcifications. Initial deployment of the device was conducted during rapid ventricular pacing to reduce pulse pressure. (**B**) Correct positioning with trivial residual paravalvular leak after valve implantation.



Video 1: Aortography. In sequence, baseline severe aortic regurgitation with no annular calcifications, initial deployment of the CoreValve during rapid ventricular pacing, no migration after release of the proximal two-thirds of the device, and correct positioning with trivial residual paravalvular leak after valve implantation.

at too high a risk for open heart surgery. Although generally considered off-label in view of the lack of aortic annular calcium, which renders valve deployment more insecure, non-conventional TAVI has also been performed in smaller series of patients considered inoperable with native valve AR. The latter include patients with prior Type A aortic dissection repair [1, 2], with a left ventricular assist device or prior heart transplantation, homograft or Ross operation failure, healed endocarditis and bicuspid valves. More often, however, TAVI for AR has been indicated as a valve-in-valve procedure in structural bioprosthetic valve deterioration.

Balloon-expandable transcatheter valves are generally considered less suitable for TAVI in native valve AR in view of their lack of intrinsic radial force and the consequent difficulties in anchoring the device at the annular level with little or no calcium [2]. In fact, despite the use of devices based on nitinol self-expanding technology, including the CoreValve and the newer generation Jenavalve (Jenavalve Technology, Inc., Munich, Germany) [5], supra-annular migration and requirement for implantation of a second valve during the procedure have been described mostly in patients with AR and no documented calcification [1]. The Jenavalve is the only valve approved for AR treatment, but requires a transapical access, which was considered at higher risk for bleeding. Importantly, the acute dissection in this particular case was limited to the ascending aorta and arch and the descending aorta was not involved. Consequently, the transfemoral approach was suitable for the procedure.

In parallel, TAVI has also been anecdotally reported to treat aortic stenosis in JWs [3, 4], thus avoiding the hazards of severe anaemia related to open heart surgery. This is an attractive approach, particularly in case of comorbidities or predicted technical challenges, such as redo surgery. In the case described, the risk of a conventional on-pump reoperation was considered disproportionate without the availability of blood products, and cannot be correctly predicted by the EuroSCORE II or the Society of Thoracic Surgeons risk models, which returned an estimated operative mortality risk of 6.54 and 6.27%, respectively.

In conclusion, this case highlights the potential for extended indications for TAVI with a self-expandable device in patients with non-calcific aortic valve disease, particularly when multiple risk factors for a conventional valve replacement operation coexist. Severe AR in a JW with a history of emergency ascending aortic surgical repair for acute dissection is a clear example of a challenging case, for which off-label TAVI may well represent the most promising option.

Conflict of interest: none declared.

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