

# Transcatheter Aortic Valve Implantation via Right Carotid Artery Route for Severe Aortic Regurgitation Management in a Patient with Chronic Operated Type A Aortic Dissection

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## ABSTRACT

**Background:** Transcatheter aortic valve implantation (TAVI) technique is now widely accepted as an alternative for the treatment of very high-risk patients in cases of aortic stenosis. However, use of this technique in cases of pure native aortic regurgitation (AR) remains discussed.

**Case Report:** We report the case of a 68-year-old patient with severe AR referred to our hospital 10 years after a supra-coronary ascending aorta replacement surgery for acute type A aortic dissection. Because of respiratory contraindication to redo sternotomy, we treated this patient with the implantation of a CoreValve prosthesis inserted via right carotid access. We discuss the TAVI strategy in the case of severe AR and the possibility to use alternative vascular access.

**Conclusion:** In very high-risk patients, TAVI can be discussed and considered as an alternative treatment for severe AR, with right carotid access proven as feasible.

## INTRODUCTION

In the last decade, transcatheter aortic valve implantation (TAVI) has become a new option in the treatment of aortic stenosis in very high-risk patients [Conradi 2012]. More recently, several authors have reported successful implantations of catheter bioprosthesis in cases of pure native aortic regurgitation (AR) [Roy 2013]. However, the application of TAVI technique remains widely dependent on the vascular access quality. Here, we report a challenging case of a high-risk patient with severe aortic regurgitation secondary to a treated type A aortic dissection. We discuss the TAVI strategy in the case of severe aortic regurgitation and the possibility to use alternative vascular access.

## CASE REPORT

A 68-year-old male patient was referred to us for the management of severe aortic regurgitation. The patient's history

revealed the following conditions: arterial hypertension, diabetes mellitus type 2, severe chronic obstructive pulmonary disease (COPD: FEV1/FVC = 0.5, FEV1 < 40%, resting PaO<sub>2</sub> 60 mmHg), and supracoronary ascending aorta replacement surgery for acute type A aortic dissection, performed 10 years ago in another hospital. During follow-up, we discovered moderate aortic regurgitation due to improper leaflet coaptation, which progressively worsened. The patient had been recently hospitalized several times for recurrent episodes of pulmonary edema. When evaluated, the patient was categorized as Class III under New York Heart Association (NYHA) functional classification. Transthoracic echocardiography revealed a Grade 4 AR with the following characteristics: the left ventricle was dilated with a left ventricle end diastolic diameter (LVEDD) of 72 mm; and ejection fraction (EF) was maintained at 52%. CT scan demonstrated a stable chronic aortic dissection involving the aortic arch with no innominate artery involvement, extending to the abdominal aorta just below the right renal artery (Figure 1, D and E). Logistic EuroSCORE 1 was only 11.05% and STS risk was

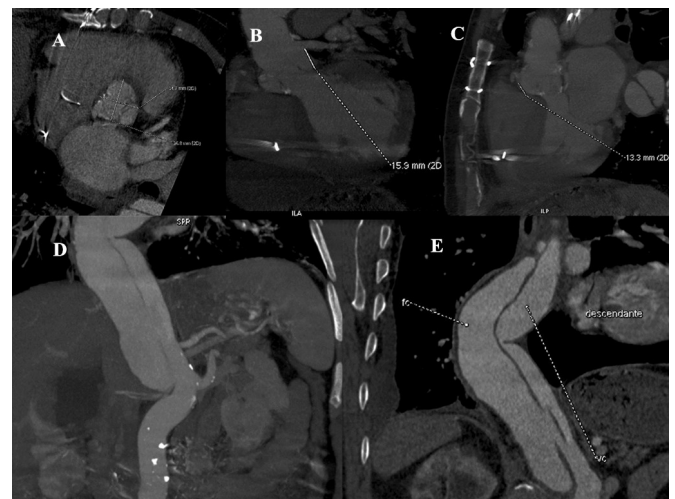


Figure 1. Preprocedural CTA depicted 2-dimensional measurements with different aspects determining prosthesis size and chronic aortic dissection, limiting vascular access. A, aortic annulus 28.5 × 27.1 mm; B, left coronary ostia height 15.9 mm; C, right coronary ostia height 13.3 mm; D, circulating true and false lumen with 2 visible intimal tears; E, extension of aortic dissection to the right renal artery.

Received July 29, 2014; accepted August 5, 2014.

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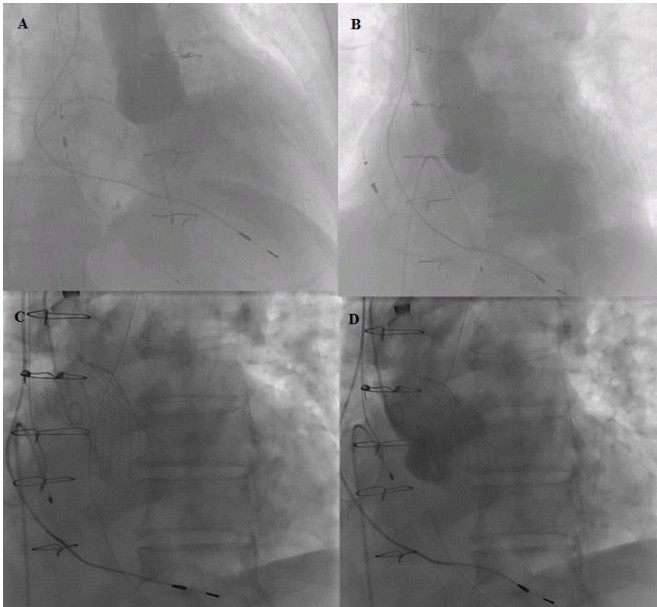


Figure 2. Periprocedural aortic angiography. A and B demonstrated severe aortic regurgitation; C and D displayed a correct prosthesis position and no residual aortic regurgitation.

5.43%. Following multidisciplinary discussion, we opted for an AR treatment strategy using TAVI with a self-expandable CoreValve (Medtronic Inc, Minneapolis, MN) through the right carotid artery. Transcranial Doppler echocardiography proved the Circle of Willis to be functional. The procedure was carried out in a hybrid operating room, with the successful implantation of a 31-mm CoreValve. Post-procedural angiography revealed no aortic regurgitation. Recovery was uneventful, and the patient was discharged on day 4. Six months later, the patient reported improved exercise tolerance, and echocardiography showed reduced left ventricle dilation (LVEDD of 65 mm versus 72 mm pre-surgery) and a similar EF, with no periprosthetic leakage, and a mean transvalvular gradient of 15 mmHg.

## DISCUSSION

Chronic AR is a common condition, with an incidence of 20% requiring reoperation following initial valve-sparing procedures for type A aortic dissection [Kobuch 2012]. It is most likely caused by the disease progression that affects the functional integrity of aortic leaflets, annulus, and sinus (sinus of Valsalva), or an inadequate geometric restoration of these three structures during primary repair procedures. For these cases, aortic valve replacement (AVR) with cardiopulmonary bypass is the treatment of choice.

While this is considered the “gold-standard” surgery, it was not suitable for our patient, who presented with severe hypoxemia at rest and impaired spirometry, suggesting that this patient presented at high-risk for pulmonary complications, prolonged ventilation, and infectious risk in this context of redo surgery. We therefore opted to use the TAVI technique,

which, since emerging in 2002, has been widely practiced all over the world as an alternative to surgical AVR in high-risk patients with severe aortic stenosis [Conradi 2012]. The challenges in performing TAVI on aortic regurgitation patients were in relation to a dilated aortic root, elliptical annulus, and lack of leaflet calcification for fluoroscopic landmark [Roy 2013]. In our patient, the major orthogonal annular diameter was 28.5 mm (Figure 1, A and B), and the annulus aortic perimeter was 89 mm; this informed our choice of a 31-mm CoreValve prosthesis (oversizing of 10% considering the perimeter measurement), which is currently the largest device available. We decided to perform the deployment of the inferior limit of the prosthesis about 6 mm below the limit of the aortic cusp, visualized with repetitive angiography during the operation. Though no periprosthetic regurgitation was observed, we believed that a more substantial oversizing of the prosthesis might be necessary for stable valve fixation, taking into account the lack of annular calcification.

An additional challenge presented by this case was the history of type A aortic dissection with persistent circulating false lumen and several intimal tears (Figure 1, D and E), increasing the vascular complication risk [Kobuch 2012]. TAVI via the left ventricular transapical route using a balloon-expandable Edwards valve or JenaValve system were impossible in this patient due to insufficient prosthesis size. Moreover, we wanted to minimize the pulmonary risk because of the COPD history. Modine et al reported encouraging outcomes by means of a transcatheter route TAVI procedure [Modine 2012], using a left carotid approach given its more direct access to the aortic valve. We adopted this technique due to the right carotid artery being, compared with the axillary artery, easier to access and control, in the event of vascular complication. This access, however, required an atheroma-free artery and a relatively short vascular occlusion time, as well as a competent Circle of Willis, assuring cerebral perfusion during carotid occlusion in order to reduce the incidence of neurological events.

Finally, there were no periprocedural complications, and the result was very encouraging. The prosthesis was well positioned, and neither paravalvular nor intraprosthetic regurgitation was detected on periprocedural angiography (Figure 2). Six months later, all short-term cardiovascular outcomes were satisfactory.

## CONCLUSION

In very high-risk patients, TAVI can be discussed and considered as an alternative treatment of severe AR, with right carotid access proven as feasible.

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