Successful Deployment of a Transcatheter Aortic Valve in Bicuspid Aortic Stenosis
Role of Imaging With Multislice Computed Tomography

Victoria Delgado, MD; Laurens F. Tops, MD; Joanne D. Schuijf, MSc, PhD; Frank van der Kley, MD; Nico R. van de Veire, MD, PhD; Martin J. Schalij, MD, PhD; Jeroen J. Bax, MD, PhD

Transcatheter aortic valve replacement (TAVR) has recently emerged as a therapeutic option for patients with severe aortic stenosis who are considered inoperable. To avoid potential complications related to this novel procedure (such as coronary artery obstruction or perivalvular leakage), detailed information on the aortic valve anatomy is critically important. Multislice computed tomography (MSCT) enables a comprehensive 3D assessment of aortic valve anatomy and, particularly, the extent and location of valve calcifications, one of the reasons for inappropriate deployment of the valved stent together with the bicuspid anatomy. After TAVR, the positioning and deployment of the valve prosthesis can be evaluated by this imaging technique.

This report concerns a 54-year-old woman with symptomatic bicuspid aortic valve stenosis (aortic valve area, 0.9 cm²). Comorbidity included hypertension and hypercholesterolemia. Importantly, 2 years earlier, the patient experienced a cerebrovascular accident with severe consequences that determined a high risk for cardiac surgery. Consequently, the patient was referred for TAVR.

The anatomy of the aortic root and, in particular, the aortic valve and the relation between the coronary artery ostia and the aortic annulus were evaluated using 64-slice MSCT, as previously described. A bicuspid aortic valve was observed, with asymmetrical closure of the valve and nodular calcifications along the basis and the free edge of the noncoronary cusp and at the valve commissures (Agatston calcium score, 2103) (Figure 1). The aortic annulus size was 26 mm, whereas the dimensions of the sinus and sinotubular junction were 37 and 33 mm, respectively. The distance between the aortic annulus and the ostium of the left coronary artery was larger than the length of the coronary cusp at that level (12.3 versus 10.5 mm, respectively). Coronary angiography showed normal epicardial coronary arteries, whereas the aortoiliac angiography revealed a narrow lumen of the iliac artery (diameter, 6.7 mm). Therefore, the TAVR was performed through a transapical approach with the guidance of transesophageal echocardiography. A 26-mm Edwards-Sapien valve (Edwards Lifesciences Inc) was successfully implanted. The mean transaortic pressure gradient reduced from 65 to 10 mm Hg. No complications were observed during the procedure.

After 1 month, 64-slice MSCT was repeated, demonstrating an accurate positioning (Figure 2) and a circular deployment of the transcatheter aortic valved stent (Figure 3).

Figure 1. Aortic valve evaluation before TAVR using 64-slice MSCT. The reconstructed short-axis view of the aortic valve shows the bicuspid anatomy of the valve with one cusp that includes the ostium of the left main and the noncoronary cusp (A). The calcifications are distributed at the bases, the free edge of the cusps, and at the commissures. The coronal plane through the left coronary artery (LCA) (B) demonstrates the asymmetrical closure of the aortic valve and the relation between the ostium of the LCA and the length of the coronary cusp, being the length of the cusp at that level (a=10.5 mm) smaller than the height of the left coronary ostium (b=12.3 mm). LA indicates left atrium; LV, left ventricle; PV, pulmonary valve; RV, right ventricle; RVOT, right ventricular outflow tract.
Patency of the coronary ostia was demonstrated, with a distance between the upper limit of the valved stent and the left coronary artery ostium of 5.3 mm. The internal area of the prosthesis at the aortic annulus level was 3.6 cm².

This case report illustrates the value of MSCT for the evaluation of aortic stenosis patients referred for TAVR; before the procedure, MSCT provides exact information on aortic valve anatomy, with an accurate sizing of the aortic annulus, the length of the coronary cusp, and the relation between the coronary ostia and the aortic annulus. After prosthesis implantation, the deployment and the positioning of the prosthesis in relation to the surrounding structures can be accurately evaluated by using MSCT.

Disclosures
Dr Bax received grants from Biotronik, BMS Medical Imaging, Boston Scientific, Edwards Lifesciences, GE Healthcare, Medtronic, and St Jude Medical. Dr Schalij received grants from Biotronik, Medtronic, and Boston Scientific. Dr Delgado is financially supported by awards from the European Society of Cardiology.

References
Successful Deployment of a Transcatheter Aortic Valve in Bicuspid Aortic Stenosis: Role of Imaging With Multislice Computed Tomography
Victoria Delgado, Laurens F. Tops, Joanne D. Schuijf, Frank van der Kley, Nico R. van de Veire, Martin J. Schalij and Jeroen J. Bax

doi: 10.1161/CIRCIMAGING.108.809434
Circulation: Cardiovascular Imaging is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 2009 American Heart Association, Inc. All rights reserved.
Print ISSN: 1941-9651. Online ISSN: 1942-0080

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://circimaging.ahajournals.org/content/2/2/e12

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in Circulation: Cardiovascular Imaging can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the Permissions and Rights Question and Answer document.

Reprints: Information about reprints can be found online at:
http://www.lww.com/reprints

Subscriptions: Information about subscribing to Circulation: Cardiovascular Imaging is online at:
http://circimaging.ahajournals.org//subscriptions/