

Late subclinical leaflet thrombosis after transcatheter replacement of a stenotic bicuspid aortic valve

Rajmund Bobrowski¹, Michał Świerczewski^{1,2}, Łukasz Kalińczuk¹, Ilona Michałowska¹, Gary S. Mintz³, Adam Witkowski¹

¹ National Institute of Cardiology, Warsaw, Poland

² Medical University of Warsaw, Warsaw, Poland

³ Cardiovascular Research Foundation, New York, United States

A 92-year-old woman with paroxysmal atrial fibrillation was admitted to the hospital because of heart failure (New York Heart Association functional class III). Transthoracic echocardiography demonstrated severe bicuspid aortic stenosis (mean gradient, 80 mm Hg; aortic valve area, 0.7 cm²) and left ventricular ejection fraction of 55%. Catheter-measured systolic pulmonary artery pressure was 80 mm Hg. Due to the high surgical risk (EuroSCORE II of 7.96 and STS score of 10.16), she was referred for transcatheter aortic valve replacement. Based on the results of 384-row computed tomography angiography (multislice computed tomography [MSCT]; SOMATOM, Siemens Healthineers, Erlangen, Germany) that showed an annulus of 20 × 26 mm in size, with a perimeter of 73 mm, and area of 387 mm² (analyzed with the automated 3mensio Valves software [Pie Medical Imaging BV, Maastricht, The Netherlands]), a 23-mm Edwards SAPIEN 3 valve (Edwards Lifesciences, Inc., Irvine, California, United States) was successfully implanted via the transfemoral route after predilation with the use of a 20-mm balloon. The residual mean pressure gradient was 6 mm Hg with no aortic regurgitation. As the patient had a CHA₂DS₂VASc score of 5 and a HAS-BLED score of 4, did not tolerate non-vitamin K antagonist oral anticoagulants, and had concomitant end-stage renal dysfunction (estimated glomerular filtration rate of 28 ml/min/1.73 m²) as well as a history of a single episode of gastrointestinal bleeding, she was referred for left atrial appendage occlusion

and discharged only on aspirin at a dose of 75 mg/d. A month later, a 24-mm Watchman device (Boston Scientific, Maple Grove, Minnesota, United States) was successfully deployed. The patient was discharged with clopidogrel 75 mg/d for 3 months in addition to her prior aspirin therapy. Four months later, she achieved New York Heart Association functional class I and underwent follow-up MSCT angiography as per the clinical protocol for post-left atrial appendage occlusion device evaluation. Calcium deposits of the native bicuspid aortic cusps limited the full expansion of the bioprosthesis, resulting in an elliptical cross-sectional shape and an eccentricity index of 19.3% (18.4 × 22.8 mm) (FIGURE 1A-1C). Multislice computed tomography also revealed hypoattenuated thickening on the surfaces of the left and right bioprosthesis leaflets that measured 2.4 mm and 4.5 mm, respectively, hallmark features of hypoattenuated leaflet thickening (HALT), and decreased motion of the left and right leaflets (78.67% and 59.65%, respectively) (FIGURE 1D and 1E).^{1,2} The sites of HALT were parallel to the extensive calcium deposits of the underlying native aortic cusps. Transthoracic echocardiography showed the mean aortic pressure gradient of 6 mm Hg and no evidence of aortic insufficiency or paravalvular leak. Three-dimensional MSCT provided an insight into the geometry of valve frame distortion caused by the solid, uncrushed calcification, potentially affecting valve leaflet motion and resulting in the deterioration of the rheological parameters of aortic flow. We have

Correspondence to:

Łukasz Kalińczuk, MD, National Institute of Cardiology, ul. Alpejska 42, 04-628 Warszawa, Poland, phone: +48 22 343 43 42, email: lukasz.kalinczuk@gmail.com
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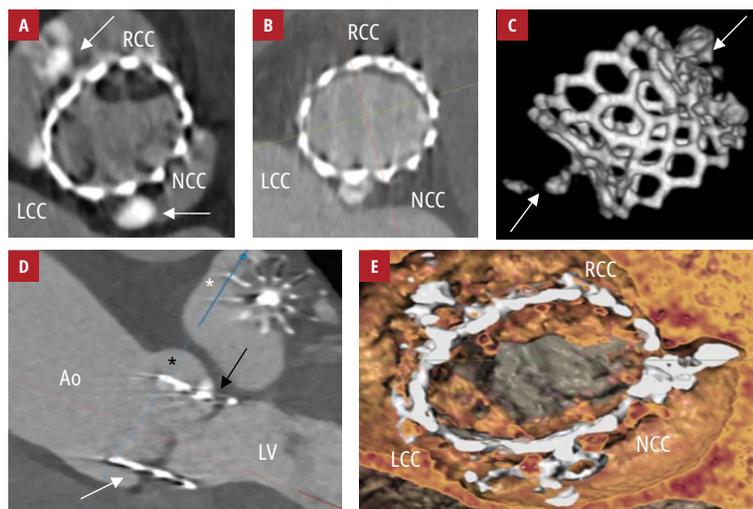


FIGURE 1 Multislice computed tomography images at 4 months: **A** – a bioprosthesis with severe residual calcium deposits (arrows) and hypoattenuated thickening of the left and right leaflets; **B** – an elliptical shape of the bioprosthesis at the inflow level; **C** – volume rendering reconstruction demonstrating bioprosthesis frame distortion and massive residual calcium deposits (arrows); **D** – longitudinal reconstruction showing thickening of the right (white arrow) and left (black arrow) leaflets as well as enlarged native sinuses (black asterisk). The Watchman device is also seen in the left atrium (white asterisk); **E** – *en face* projection showing maximal systolic leaflet opening and immobile left and right leaflets
Abbreviations: Ao, aorta; LCC, left coronary cusp; LV, left ventricle; NCC, noncoronary cusp; RCC, right coronary cusp

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previously shown that large-field intravascular ultrasound offers an online tomographic perspective with the highest visual resolution that could improve transcatheter aortic valve replacement guidance aimed at optimal valve expansion.³ Enlarged sinuses, which are common in bicuspid aortic valves, promote incomplete apposition and expansion of the transcatheter heart valve. This, in turn, creates areas of stasis (within valve frame sites and leaflet folds) to become a nidus for local thrombus formation and delayed endothelialization.^{4,5} Of note, HALT carries an increased risk of subsequent embolic events and may also affect valve durability, but optimal antiplatelet and antithrombotic regimens have not been established yet. In the end, in our patient, aspirin 75 mg/d was changed to clopidogrel 75 mg/d and MSCT was scheduled after 6 months.

ARTICLE INFORMATION

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CONFLICT OF INTEREST None declared.

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