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CARDIOVASCULAR FLASHLIGHT
Cardiac imaging

Large field-of-view intravascular ultrasound for peri-procedural tomographic insights into valve-in-valve frame expansion

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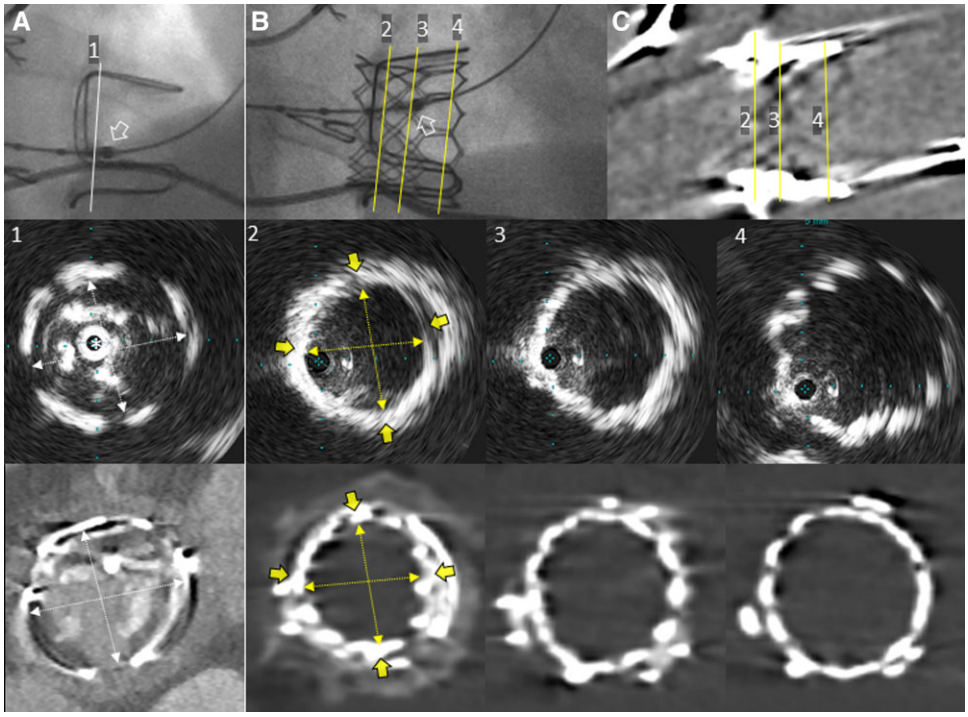

A 59-year-old woman with Ebstein's anomaly post-surgical implantation of a 31 mm Carpentier-Edwards bioprosthesis in 1987 and with a dual-chamber permanent pacemaker (2003) had progressive dyspnoea. Transthoracic echocardiography (TTE) revealed transbioprosthesis max/mean diastolic gradient of 28.9/14.5 mmHg. Patient was qualified for valve-in-valve transcatheter tricuspid valve replacement using an Edwards SAPIEN 3™ 29 mm (Edwards Lifesciences Corp., Irvine, California, USA). Intravascular ultrasound with a 10 MHz Vision PV035 (IVUS; Philips North America Corporation, Andover, MA, USA) offering a 60 mm imaging field was used to assess actual valve expansion (*Panel A*, *arrow indicates IVUS transducer*).[1–3] It showed calcified and immobile *bioprosthesis*

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leaflets with geometric orifice area of 55 mm^2 and inner-ring dimension of 24.6 × 27.6 mm (*Panel 1*, *asterisk indicates transducer and arrows indicate inner-ring diameters*), corresponding with baseline angio-CT inner-ring diameters of 24.6 × 26.8 mm (*Panel 1*, *the lower row*; 384-row SOMATOM® Definition Flash, SIEMENS, Forchheim, Germany). SAPIEN 3™ was deployed with pre-dilation using a 25 mm balloon (*Panel B*). IVUS revealed the following: (i) the valve inflow (overlapping the ring) to be elliptical with outer frame diameters of 24.1 × 28.5 mm (eccentricity index of 1.18) and 77% expansion of its outer nominal area (535/695 mm^2, *Panel 2*), (ii) the valve mid segment round (27.1 × 27.7 mm) with 83% expansion (578/695 mm^2, *Panel 3*), and (iii) the valve outflow round (32.1 × 33.0 mm) with 105% expansion (733/695 mm^2, *Panel 4*). Diastolic gradient assessed invasively was <2 mmHg; thus, post-dilation was omitted despite IVUS findings. Next day, TTE measured max/mean diastolic gradient was increased (18.7/6.2 mmHg). Angio-CT confirmed SAPIEN 3™ underexpansion with measured dimensions that matched IVUS results (*Panel C, relevant cross-sections displayed in the lower row*). Abnormally increased residual gradients are reported in 60–80% of VIV transcatheter valve replacements despite transoesophageal echo guidance. IVUS might be more accurate to optimize procedural results, relying on actual 3D valve frame expansion which determines restored flow, not affected by general anaesthesia.

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Data availability

The authors confirm that the data supporting the findings of this study are available within the article.