Transcatheter pulmonary and tricuspid valve-in-valve replacement for bioprosthesis degeneration in carcinoid heart disease

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A 65-year-old lady presented with worsening peripheral oedema and functional limitation secondary to degeneration of St Jude Epic 21 mm pulmonary and St Jude Epic 27 mm tricuspid valves surgically implanted 4 years previously for carcinoid heart disease. She had maintained NYHA Class I functional capacity until 6 months previously but was now dyspnoeic after walking 100 yards. Echocardiography demonstrated severe pulmonary regurgitation and stenosis, severe tricuspid regurgitation and stenosis, and right ventricular impairment.

Repeat surgery was considered too high risk, and concomitant transcatheter pulmonary and tricuspid valve-in-valve implantation was planned. Under general anaesthesia and intravenous octeotride cover, the right femoral vein was catheterized and pericardium opened via a left thoracotomy. The patient’s existing pacing system was explanted and temporary epicardial pacing established. A 26-French Ascendra sheath was positioned at the right ventricular apex. A balloon-mounted 20-mm Edwards Sapien XT bioprosthetic valve was implanted into the pulmonary position, and a 26-mm Edwards Sapien XT valve was then implanted into the tricuspid position under burst pacing. Transoesophageal echocardiography confirmed successful deployment, with no regurgitation and reduced transvalvular velocities. A transvenous pacing lead was positioned in the coronary sinus, providing ventricular pacing, ventricular sensing, inhibition response, rate-responsive permanent pacing. The patient was discharged after 6 days without complication.

At 6-month follow-up, she is asymptomatic and recently returned from walking in the Alps.

To our knowledge, this is the first reported transcatheter, transapical tricuspid, and pulmonary valve-in-valve replacement for bioprosthetic valve degeneration for any condition. This offers an option for high-risk patients requiring repeat surgery in carcinoid disease, where the prognosis is grave.

Top row, left to right [pulmonary valve pre-procedural transthoracic echocardiogram (TTE)]—A1/A2: severe PR with jet width 1.38 cm and pressure half-time 142 ms; A3/A4: severe PS with average Vmax 4.4 m/s, average peak gradient 77 mmHg, average mean gradient 46 mmHg, and average velocity time integral (VTI) 130 cm.

Row two, left to right (tricuspid valve pre-procedural TTE)—B1/B2: severe TR with vena contract 0.8 cm, PISA radius 0.9 cm, ERO 0.45 cm² and dense Doppler envelope; B3/B4: severe TS with turbulent forward flow, with average Vmax 1.8 m/s, average peak pressure gradient 13 mmHg, average mean pressure gradient 7 mmHg, and average VTI 77 cm.

Row three, left to right (intraprocedural fluoroscopy)—C1: balloon inflated within Edwards Sapien XT 20-mm bioprosthetic valve in pulmonary valve (*), sheath catheter (**); C2: balloon inflated within Edwards Sapien XT 26-mm bioprosthetic valve in tricuspid position (*), transoesophageal echocardiogram (TOE) probe (**); C3: both valves successfully implanted (*), coronary sinus permanent ventricular pacing lead (**).

Row four, left to right (pulmonary valve post-procedural TTE)—D1: the absence of PR; D2: stable pulmonary bioprosthetic valve in valve; D3: significantly reduced antegrade velocities demonstrating successful valve implantation and resolution of PS with Vmax 2.3 m/s, peak gradient 20 mmHg, mean gradient 14 mmHg, and VTI 56 cm.

Row five, left to right (tricuspid valve post-procedural TOE)—E1: the absence of TR; E2: stable tricuspid bioprosthetic valve in valve; E3: significantly reduced antegrade velocities demonstrating successful valve implantation and resolution of TS with Vmax 0.9 m/s, peak gradient 3 mmHg, mean gradient 2 mmHg, and VTI 25 cm.