Images in Cardiovascular Medicine

First in Human Transapical Implantation of an Inverted Transcatheter Aortic Valve Prosthesis to Treat Native Mitral Valve Stenosis

Ragheb Hasan, MD, FRCS (CTh); Vaikom S. Mahadevan, MBBS, MD, FRCP; Heiko Schneider, MRCP; Bernard Clarke, BSc, MBChB, MD, FRCP, FACC, FESC

Transcatheter aortic valve implantation has become well established in the past decade. Its superiority in comparison with conventional surgical aortic valve replacements in high-risk patients has been demonstrated in the Partner Cohort B trial.1

We report the first case of using an inverted transcatheter Edwards Sapien valve (Edwards Lifesciences, CA) in the native mitral valve position, to treat severe calcific mitral stenosis. A 70-year-old woman was admitted to the intensive care unit after having had a cardiorespiratory collapse requiring ventilatory support. She was initially referred for assessment of worsening breathlessness, 7 years after coronary artery bypass grafting and aortic valve replacement with a 21-mm Top Hat (Sulzer, Carbomedics, Austin, TX) valve. Investigations in another center revealed patent grafts, severe calcific mitral stenosis with a valve area of 0.9 cm² and a mean gradient of 14 mmHg. There was also a past history of left lower lobe resection for recurrent bronchiectasis. After ventilation in the intensive care unit, transesophageal echo test confirmed severe calcific mitral stenosis (Figures 1 and 2; Movie I in the online-only Data Supplement), which was deemed unsuitable for percutaneous balloon valvuloplasty because of severe calcification of the leaflets and the risk of producing severe mitral regurgitation. Prosthetic aortic valve function was normal. While in intensive care, she developed pneumonia with a collapse of the left lung. Because the risk for conventional surgery was prohibitive, the multidisciplinary team decided that transapical implantation of an Edwards Sapien valve should be attempted. Although the patient continued to require ventilatory support, she was able to communicate, and, after detailed discussion with her and the family, it was decided to proceed with transapical implantation of a transcatheter aortic valve on compassionate grounds.

The procedure was performed under a general anesthetic with 3-dimensional echocardiographic transesophageal echo guidance, which revealed a mitral annular size of =31 mm. A transvenous temporary pacing wire was positioned in the right ventricular apex. Transapical access was achieved via a small thoracotomy and the mitral valve crossed retrogradely with a .035-in wire, which was placed in the right lower pulmonary vein and thereafter exchanged for an Amplatzer Super Stiff (Boston Scientific, MA) exchange length wire (Figure 3). The valve was balloon dilated initially to assess pliability and for sizing purposes, with the use of a 24-mm Amplatzer (St. Jude Medical, MN) sizing balloon under rapid pacing at 180 bpm, which confirmed that the valve was pliable with a minor residual waist (Figure 4). This resulted in significant regurgitation, as expected (Movie II in the online-only Data Supplement). An inverted 29-mm Edwards Sapien valve was implanted under rapid pacing at 180 bpm with the use of an Ascendra (Edwards Lifesciences, CA) transapical system. Postdilatation was performed with the same balloon, because the proximal portion of valve appeared to be slightly under expanded, with an extra 1 mL of contrast added. This resulted in an excellent angiographic appearance, and echocardiography confirmed an appropriate valve position with no evidence of any mitral regurgitation (Figures 5 and 6; Movies III and IV in the online-only Data Supplement). The mean gradient across the implant was 7 mm Hg. Standard surgical closure of the apex was completed. The patient had no cardiac issues postprocedure, although overall recovery was delayed because of the slow resolution of the collapse of the left lung.

The implantation of an inverted transcatheter Edwards Sapien valve by the use of a transapical approach could be considered as an option for patients with severe mitral valve disease and annular calcification who are deemed either very high risk or unsuitable for conventional mitral valve surgery.

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Disclosures

Dr Mahadevan is a proctor for Edwards Life Sciences. The other authors report no conflicts.

From the Manchester Royal Infirmary, Central Manchester University Hospitals NHS Foundation Trust(R.H., V.S.M., B.C.); and Institute of Cardiovascular Sciences, University of Manchester, Manchester, UK (V.S.M., H.S., B.C.).

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Correspondence to Vaikom S Mahadevan, MBBS, MD, FRCP, Manchester Royal Infirmary, Oxford Rd, Manchester, M13 9NL, United Kingdom.

E-mail vaikom.mahadevan@cmft.nhs.uk
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Figure 5. Deployed valve.

Figure 6. Post valve implantation.
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