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Percutaneous Transjugular Implantation of MELODY® Valve Into Tricuspid Bioprosthesis

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Abstract

We present the technique of transcatheter balloon expandable (MELODY®) valve-in-valve deployment in a frail octogenarian with a failed previous tricuspid bioprosthesis. In patients who are not candidates for conventional surgery, transcatheter approach provides an alternative that warrants careful consideration.

Keywords

Valve repair/replacement; Coronary artery disease; Cardiovascular pathology

Introduction

Octogenarians and older patients are a difficult group to operate upon. In addition to the expectant risks of a reoperation in this cohort, there are also at high risk for developing postoperative hepatorenal dysfunction, among other clinical problems. To this end, creative solutions that are minimalistic in their approach while providing high yield are important to consider.

Surgical Technique

An 84-year-old frail female with a history of stroke, advanced carotid disease, long standing atrial fibrillation, chronic renal insufficiency, and a degenerative tricuspid valve (TV) bioprosthesis presented with worsening bilateral lower extremity edema and fatigue. She had previously undergone two-vessel coronary revascularization with concomitant TV replacement using a 29mm Medtronic Mosaic® bioprosthesis (Medtronic Inc., Fridley, MN) 12 years previously. Preoperative transthoracic echocardiography demonstrated: 1) severe TV regurgitation and stenosis (TV area of 0.8cm², mean TV gradient of 15mmHg), 2) low pulmonary artery pressures and, 3) good right ventricular function (Figure 1). Preoperative cardiac catheterization revealed patent coronary grafts with a 23mm inner diameter of the bioprosthesis. Given the patient's high functionality despite several co-morbidities, a transcatheter valve-in-valve replacement with a MELODY® Valve (Medtronic Inc., Minneapolis, MN) was offered. The MELODY® Valve is a bovine jugular vein valve.

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In the hybrid operating room under general anesthesia, the right jugular vein was accessed percutaneously. The MELODY® Valve was mounted on a 22mm Ensemble® balloon delivery system (Medtronic Inc., Fridley, MN) and inserted across the tricuspid bioprosthesis under fluoroscopic guidance (Figures 2A–C). After confirming appropriate positioning, the MELODY® Valve was deployed with the 22mm balloon without rapid ventricular pacing and further expanded using a 25mm balloon to ensure it was seated well (Figures 2D–F). Postoperative echocardiography demonstrated a 5mmHg mean gradient across the TV with no evidence of regurgitation (Figure 3). The patient was extubated in the hybrid suite, and discharged home 48 hours later. Repeat catheterization at three-month follow-up exhibited 1mmHg gradient across the TV, and at nine-months, the patient's peripheral edema and fatigue remain resolved. She continues to live independently.

An exemption to report this de-identified case from the Human Investigations Committee at the University of Virginia was not pursued.

Comment

We present the successful off label implantation of a MELODY® valve-in-valve in an octogenarian with a degenerated tricuspid valve bioprosthesis who was not an optimal candidate for open repair. Similar attempts in pediatric populations have been successful [1–3]. Percutaneous implantation of an Edwards SAPIEN® valve (Edwards Lifesciences Corp., Irvine, CA) has been previously performed in a dysfunctional tricuspid bioprosthesis in pediatric and adult patients [4, 5], ours is the first report to demonstrate efficacy of a MELODY® valve-in-valve in an older inoperable adult.

Our decision to place a MELODY® valve-in-valve was predicated on several clinical factors. Although intervening in this functionally independent octogenarian could be challenged; she developed progressive bilateral lower extremity edema and fatigue with dyspnea that had failed conservative therapy. Given evidence that her STS predicted risk of mortality approached 9%, a transcatheter approach was ideal.

The MELODY® Valve has been approved for transpulmonary valve implantation in pediatric patients. As such, the MELODY® Valve functions well in the lower pressure right heart system. Stent fractures are of great concern when implanting MELODY® valves in the right ventricular outflow tract [6, 7]. Implantation of this valve for right ventricular outflow tract conduit dysfunction in 34 patients across three centers (mean age 19±8 years) had a 27% stent fracture rate [8]. The Edwards SAPIEN® XT Valve has the advantage of being available in larger sizes when compared with the MELODY® Valve. Additionally, its shorter stent causes less protrusion into the adjacent cardiac chambers. On the other hand, correct deployment could be perhaps more difficult, but can be made safer by using rapid pacing and by using a jugular approach when the landing zone, i.e., atrial side of the dysfunctional bioprosthesis has a cranial orientation. Specifically, the Edwards SAPIEN® XT Valve would have been more difficult to implant in this position given the shorter stent height of 14.3mm in comparison to the longer length of the MELODY® Valve (22mm). While there is insufficient data to conclude that one of the products is superior versus the other, and in theory either valve might have been efficacious, the MELODY® Valve provides a minimally invasive option in the management of older adult patients with advanced tricuspid disease.

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Figure 1.
Preoperative transthoracic echocardiography demonstrates severe TV regurgitation and stenosis with low pulmonary artery pressures

Figure 2.

Figure 2A. MELODY® Valve mounted on 22mm Ensemble® balloon delivery system

Figure 2B. Lunderquist wire through tricuspid bioprosthesis (black arrow)

Figure 2C. MELODY® Valve (black arrow) on Ensemble® system through tricuspid bioprosthesis (fenestrated arrow)

Figure 2D. Fluoroscopic confirmation of valve-in-valve (black arrow)

Figure 2E. Fluoroscopy guided deployment of MELODY® Valve (black arrow)

Figure 2F. MELODY® Valve (black arrow) fully deployed inside tricuspid bioprosthesis (fenestrated arrow) on completion ventriculogram

Figure 3.
Postoperative transthoracic echocardiography demonstrates 5mmHg gradient across TV without regurgitation