

# Hybrid alternate approach for complex radiation-induced valvular disease

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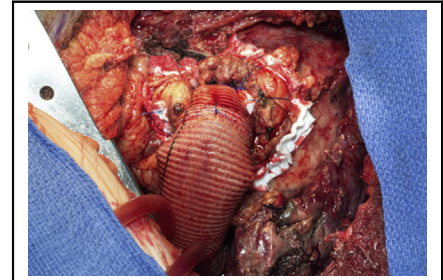
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Radiation-induced heart disease is a challenging condition, and patients often present with a number of difficult cardiac conditions, such as ascending aorta calcification, mitral valve (MV) disease with variable degree of mitral annular calcification (MAC), coronary artery disease, aortic valve pathology, severe diastolic dysfunction, and multiple previous cardiac interventions, which complicates the treatment strategy. Several techniques have been described to treat the heavily calcified MV annulus during MV replacement.<sup>1</sup> Most of these techniques require some degree of annular calcium débridement, which may increase the risk of atrioventricular groove disruption. For patients with isolated MV stenosis and severe MAC, we have already described an alternate sternotomy approach that uses a conduit from the aortic stenosis atrium (LA) to the left ventricle (LV).<sup>2</sup>

We describe the complex situation of a morbidly obese patient with radiation-induced heart disease and a history of 2 previous bypass interventions who presented with severe symptomatic aortic stenosis, severe mitral stenosis with severe MAC, and associated porcelain ascending aorta. We present the case of this patient, who underwent a hybrid approach consisting of LA-LV conduit placement through a left thoracotomy for severe mitral stenosis and a transcatheter aortic valve replacement (TAVR) for severe aortic stenosis.

## CASE REPORT

A 48-year-old woman with severe radiation-induced valve disease, porcelain aorta, severe MV stenosis with severe MAC, severe aortic stenosis, and a history of 2 previous coronary artery bypass grafting procedures was referred to our institution because of advanced heart failure and home oxygen therapy. Other significant medical history included severe obesity (body mass index of 51 kg/m<sup>2</sup>), pulmonary hypertension (right ventricular systolic pressure of



Completion of the left atrial to left ventricular apex anastomosis with a valved conduit.

### Central Message

We present a hybrid approach consisting of LA-LV conduit placement through a thoracotomy for severe mitral stenosis and transcatheter aortic valve replacement for severe aortic stenosis.

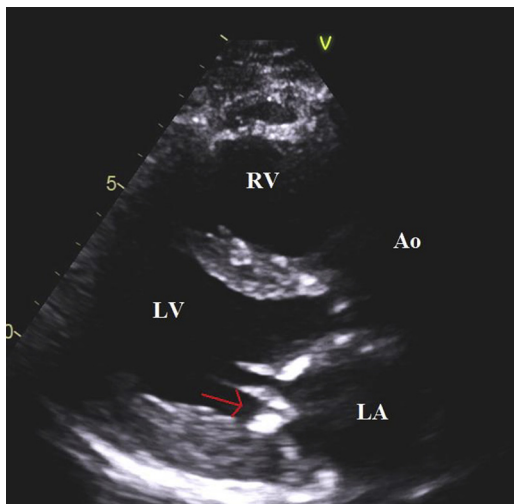
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79 mm Hg), and diabetes mellitus. The patient had undergone chest radiotherapy for Hodgkin lymphoma.

The preoperative transthoracic echocardiogram showed normal LV ejection fraction, severe MV and aortic valve stenosis (MV mean gradient of 18 mm Hg and aortic valve mean gradient of 40 mm Hg), a severely calcified MV annulus, and mild mitral regurgitation (Figure 1). Chest computed tomography showed a porcelain aorta. The patient was offered LA-LV conduit placement through a left thoracotomy, combined with staged TAVR.

The patient was positioned in a right lateral decubitus position (Figure 2, A). We achieved peripheral arterial and venous cannulation through the left common femoral artery and vein. Right lung ventilation was achieved with double-lumen endotracheal intubation. A left thoracotomy was carried over the fifth rib. Dissection was carried down to the apex of the heart and the confluence between the left lower pulmonary vein and LA. After heparin administration, cardiopulmonary bypass was initiated. We tangentially clamped this confluence and performed an end-to-side anastomosis of the 26-mm conduit with continuous 4-0 Prolene suture (Ethicon, Inc, Somerville, NJ). We then sutured a reversed 23-mm bileaflet mechanical valve (Abbott Laboratories, Abbott Park, Ill) from outside the graft (Figure 2, B). An apical left ventriculotomy was performed (Figure 2, C),

## Case Report



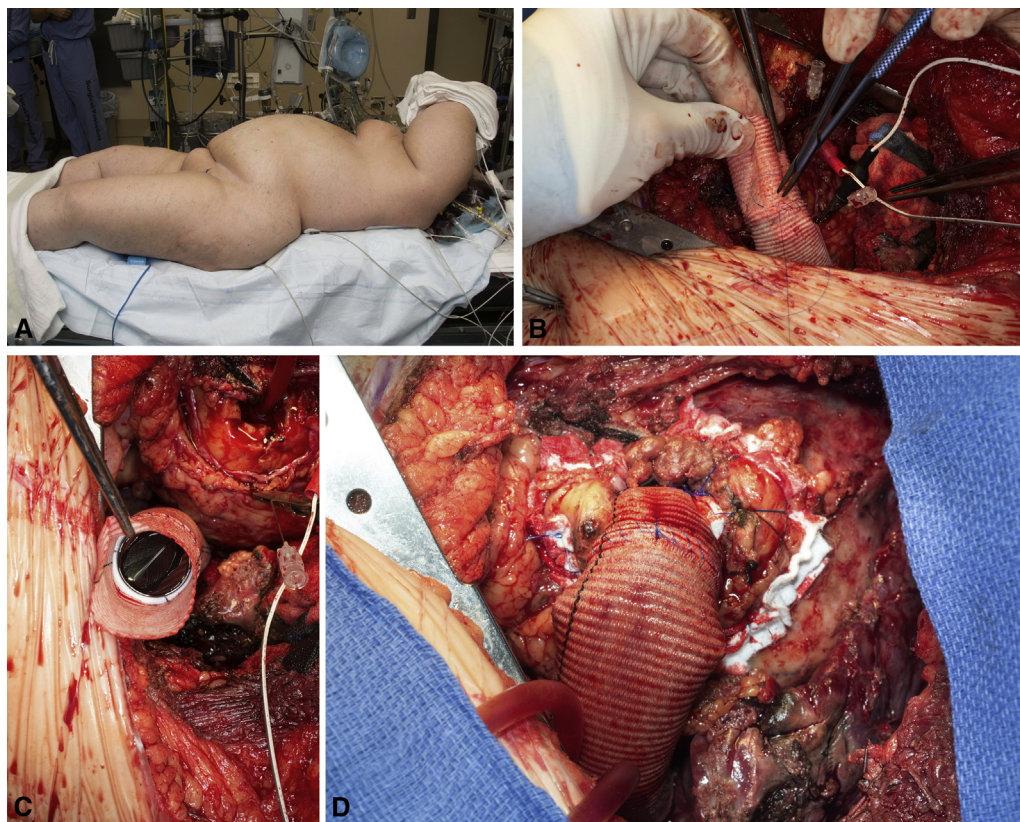
**FIGURE 1.** Preoperative transthoracic echocardiographic parasternal long-axis view shows extensive mitral annular calcification (*red arrow*) and a small aortic annulus. *RV*, Right ventricle; *Ao*, aortic root; *LV*, left ventricle; *LA*, left atrium.

and the anastomosis of the conduit to the apex was performed during ventricular fibrillatory arrest with 12 interrupted 2-0 Ethibond (Ethicon) sutures with

polytetrafluoroethylene felts reinforced with a running 2-0 Prolene suture (*Figure 2, D*). Deairing was performed with an 18-gauge needle at the LV apex before attempting to wean the patient from cardiopulmonary bypass. Intraoperative transesophageal echocardiography showed an improved native MV mean gradient of 8 mm Hg, in contrast with the 18-mm Hg preoperative gradient, and appropriate flow through the designed conduit. A few days later, we subsequently performed a transfemoral TAVR procedure in the hybrid suite. Unfortunately, the patient died approximately 4 months after surgery at the hospital as a result of deconditioning.

## DISCUSSION

Radiation heart valve disease, especially in the context of multiple previous cardiac interventions, represents a complex entity. For these cases, a hybrid innovative approach can be performed to alleviate complications related to porcelain aorta, multiple reentry, or MAC. Our technique differs slightly from the description by Wright and colleagues,<sup>3</sup> in which proximal anastomosis to the LA is performed at the interatrial groove, as well as the description by Said and Schaff,<sup>2</sup> in which proximal anastomosis to the LA is



**FIGURE 2.** Completion of the left atrium–left ventricle apex anastomosis with a valved conduit. *A*, Positioning. *B*, External suturing of the mechanical valve to the conduit. *C*, En face view of the mechanical valve (*bottom left*) and the left ventricle apex (*top right*). *D*, Completed distal anastomosis of the conduit to the left ventricular apex.

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