Severe aortic insufficiency associated with left ventricular dysfunction and aortic coarctation

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Postductal congenital coarctation of the aorta associated with severe aortic insufficiency and left ventricular failure is unusual in adults. Such a life-threatening situation deserves special consideration. Patient improvement depends on an emergent aortic valve replacement and normalization of peripheral vascular resistance in order to decrease cardiac workload and optimize recovery of left ventricular contractility. However, performing concomitant surgical corrections increases mortality and morbidity associated with the procedure. We describe a patient with this condition. The surgical treatment and the long-term management are discussed.

Case report

A 51-year-old man was admitted to the Montreal Heart Institute for management of congestive heart failure of recent onset. He had never been treated for cardiac disease and was a former marathon runner. Echocardiography revealed severe aortic insufficiency associated with left ventricular dysfunction. His left ventricular ejection fraction was calculated at 29%. Coronary angiography showed a 70% stenosis very distally in the left anterior descending coronary artery. Angiography of the descending thoracic aorta (performed during coronary angiography) showed a postductal aortic congenital coarctation with a transcoarctation gradient of 60 mm Hg. Physical examination corroborated the angiographic findings. Because of this man's precarious physical condition, we elected to manage both problems during the same procedure. An aortic valve replacement (Carbomedics 23 mm diameter valve; Sulzer Carbomedics, Austin, Tex.) was carried out through a standard sternotomy along with ascending to descending thoracic aortic bypass (12-mm Dacron graft). To help fashion the distal anastomosis on the midthoracic aorta, a limited anterolateral thoracotomy through the fourth intercostal space was added. The transcoarctation gradient decreased to 10 mm Hg. The patient's recovery was uncomplicated and he was asymptomatic 4 years later. He has not been readmitted for cardiac failure, and with medication his blood pressure was normal. Magnetic resonance imaging 3D reconstruction 50 months postoperatively confirmed the patency of the graft (Fig. 1). Concomitant echocardiography revealed a 55% left ventricular ejection fraction and an end-diastolic left ventricular diameter of 54 mm.

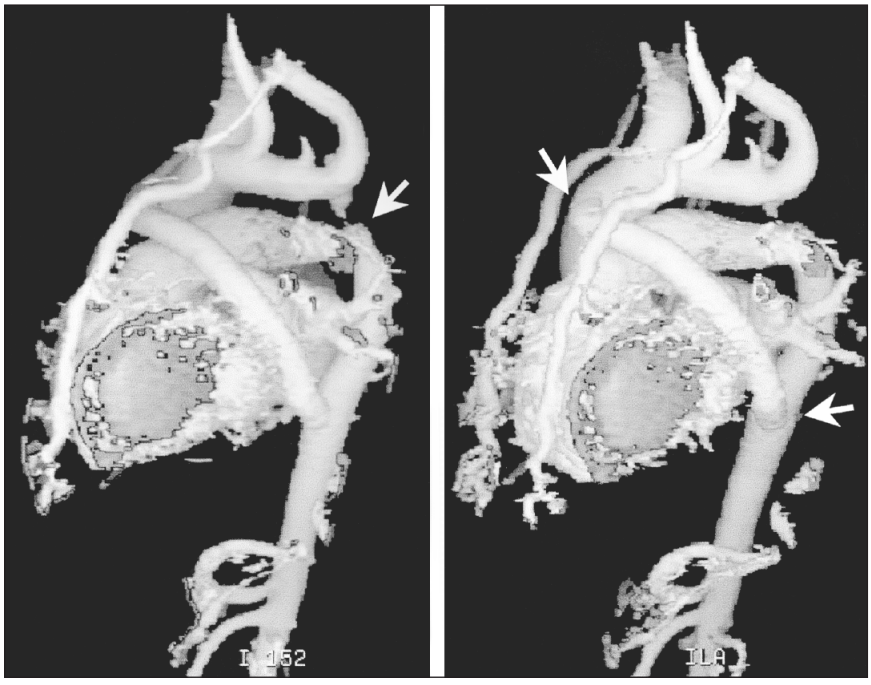

FIG. 1. 3D reconstruction with magnetic resonance imaging. Left: Arrow indicates coarctation site. Right: Arrows indicate the proximal and distal graft anastomotic sites.

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Discussion

Combined surgical procedures carried out simultaneously on the heart and the descending thoracic aorta are uncommon for cardiac surgeons. Edie and colleagues[1] were the first to report such an attempt, in 1975. They used an ascending to descending thoracic aortic interposition graft in 4 cases of recurrent coarctation of the thoracic aorta. All procedures were successful, and postsurgical gradients remained under 15 mm Hg. Excellent long-term results with this approach were reported by others.[2] Few options are available to surgeons when dealing with disease of both the heart and the descending thoracic aorta. The procedure can be either staged or performed simultaneously.[3] The 2 procedures can also be completed using 2 different surgical approaches (either sternotomy to access the heart followed by the anterolateral thoracotomy to access the descending thoracic aorta) or a single approach, generally a sternotomy. The descending thoracic aorta is then accessed through the posterior pericardium just above the diaphragm.[4] In the latter situation, the bypass graft from the ascending aorta can be routed either toward the left aspect of the heart (around the left atrial appendage)[4] or toward the right aspect (behind the inferior vena cava) before being connected to the descending thoracic aorta.[5]

The coarctation could also have been removed through the sternotomy. This could be achieved by dissecting the distal transverse aorta and interposing a short Dacron graft in the proximal descending thoracic aorta. This is more commonly performed in children; in adults, it does not give easy access to the distal suture line if there is persistent bleeding once cardiopulmonary bypass has been discontinued.[6] In the present case the graft was routed around the left atrial appendage through the posterior pericardium, and we used an anterolateral thoracotomy to secure the descending aortic anastomosis. This allowed freedom to revise the distal aortic anastomosis at any time after interruption of the extracorporeal circulation. It was particularly helpful in the present case since extensive manipulations of a dilated dysfunctional heart can rapidly lead to hemodynamic instability. Correction of both conditions at the same time is potentially harmful. Pethig and colleagues[7] reported hemodynamic instability in 2 patients after a combined correction of aortic insufficiency and aortic coarctation. They attributed the phenomenon to a sudden decrease in diastolic pressure in a severely hypertrophic heart. We did not note this in our case and it was not seen in larger series.[8] Our patient's postoperative course was uncomplicated, and the long-term follow-up confirmed the success of the operation as shown by normalization of the blood pressure, the positive remodelling of the myocardium and the patency of the graft. The use of a second approach, anterior thoracotomy, was well tolerated and did not affect the postoperative course. When this patient's condition was first evaluated at our institution, the experience of our interventional cardiologist with percutaneous angioplasty of the native coarctation, as reported by others,[9] was quite limited. It is likely that in the current era, the option of attempting a percutaneous balloon angioplasty of the coarctation before surgery would have been considered.

Although the clinical situation that we have described is unusual, several options are available and the surgeon has to consider the one most appropriate to the patient's condition.

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