The Heart Surgery Forum #2006-1027
9 (3), 2006 [Epub May 2006]
doi:10.1532/HSF98.2006-1027

Online address: http://cardenjennings.metapress.com/link.asp?id=112496

Left Ventricular Reconstruction as an Alternative to Heart Transplantation: A Case Report

Ulrik Sartipy,[1] Ulf Kjellman,[3] Sten Samuelsson,[1] Inger Hagerman,[2] Gerhard Wikström,[4] Thomas Larsson,[5] Anders Albåge,[1] Dan Lindblom[1]

Departments of [1]Cardiothoracic Surgery and Anesthesiology and [2]Cardiology, Karolinska University Hospital, Karolinska Institutet, Stockholm; Departments of [3]Cardiothoracic Surgery and [4]Cardiology, Uppsala University Hospital, Uppsala; [5]Department of Clinical Physiology, Karolinska Institutet at Södersjukhuset, Stockholm, Sweden

ABSTRACT

A 57-year-old man with dilated cardiomyopathy was referred to our institution to be assessed for heart transplantation. He had symptoms of severe heart failure and left ventricular dysfunction. We proposed surgical ventricular restoration (the Dor procedure) as an alternative to heart transplantation. The patient underwent successful surgery and an uneventful postoperative course. Pre- and postoperative investigations are presented. One year after surgery, the patient is in good clinical and functional condition. This case illustrates that surgical ventricular restoration can be an alternative to heart transplantation.

CASE REPORT

A 57-year-old man, a former smoker with a history of hypertension, underwent coronary angiography in 1995 due to atypical chest pain on exertion. There were no findings of coronary pathology. Approximately 1 hour after the procedure there was a sudden onset of severe chest pain and electrocardiography showed massive ST-elevation in the anterior leads. The patient was taken back to the catheterization lab and an occluding thrombus was found in the left anterior descending artery (LAD). Despite multiple efforts to open the vessel, a large anterior myocardial infarction developed. Consequently, the patient suffered from an LAD occlusion and an acute myocardial infarction without presence of coronary artery disease. Over the years, heart failure progressed and the patient was referred to our institution to be assessed for heart transplantation.

Medical treatment consisted of a daily intake of 25 mg spironolactone, 80 mg furosemide, 20 mg enalapril, and 200 mg metoprolol. Preoperative investigations (Table) included magnetic resonance imaging and right heart catheterization. Coronary angiography revealed no significant lesions. The LAD, which had been occluded in 1995, was found to be recanalized. Ventriculography showed an enlarged left ventricle with anteroseptal and apical dyskinetic motion. There was no mitral incompetence. The patient had no history of palpitations or ventricular arrhythmias. He underwent programmed electrical stimulation, and sustained monomorph ventricular tachycardia (VT) could be induced.

Based on our experience of surgical ventricular restoration (SVR) [Sartipy 2005; Sartipy 2006] and the preoperative

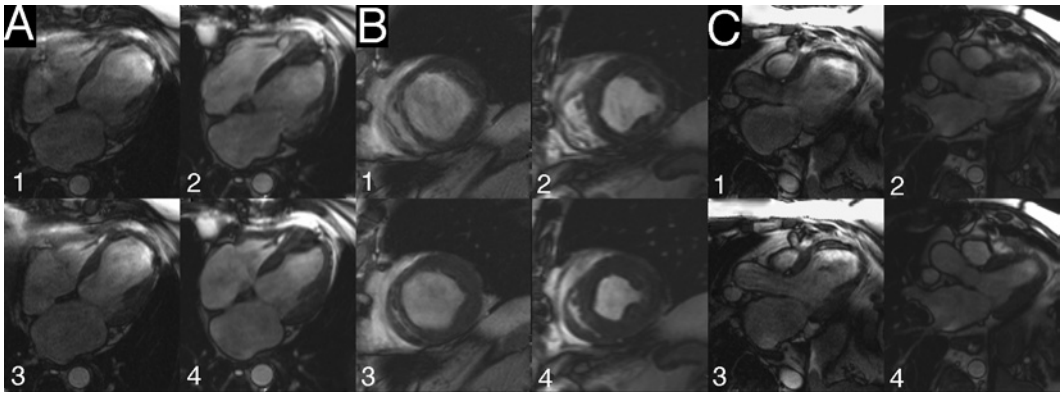
Results of Pre- and Postoperative (6 Months) Investigations*

	Preoperative	6 Months Postoperative
New York Heart Association class	IIIB	II
6MWT, m	415	480
LVEDD by echocardiography, mm	62	56
Magnetic resonance imaging data		
End-diastolic volume index, mL/m^2	85	77
End-systolic volume index, mL/m^2	55	36
Cardiac catheterization data		
PCWP: mean at rest, mmHg	15	9
PCWP: mean at work, mmHg	21	21
PAP: mean at rest, mmHg	17	13
PAP: mean at work, mmHg	20	30
AVO_2D: rest, mL/L	82	61
AVO_2D: work, mL/L	146	132
Cardiac index: rest, L/min/m^2	1.8	2.3
Cardiac index: work, L/min/m^2	2.6	3.9
Stroke volume: rest, mL	43	93
Stroke volume: work. mL	56	103
Maximal oxygen uptake, mL/kg/min	10	—
Ejection Fraction (RVG), %	14	38
NT-pro-BNP, ng/mL	1239	354
Inducible ventricular tachycardia	Yes	No

*6MWT indicates 6-minute walk test; LVEDD, left ventricular end-diastolic diameter; PCWP, pulmonary capillary wedge pressure; PAP, pulmonary artery pressure; AVO_2D, Arterio-venous oxygen difference; RVG, radionuclide ventriculography; NT-pro-BNP, N-terminal pro-B-type natriuretic peptide.

Received February 27, 2006; received in revised form March 3, 2006; accepted March 22, 2006.

Address correspondence and reprint requests to: Ulrik Sartipy, MD, Department of Cardiothoracic Surgery and Anesthesiology, Karolinska University Hospital, SE-171 76 Stockholm, Sweden; 46-8-517-700-00; fax: 46-8-33-19-31 (e-mail: Ulrik.Sartipy@karolinska.se).



Cardiac magnetic resonance imaging with 4-chamber (A), short-axis (B) and 3-chamber (C) views. End-diastolic preoperatively (1) and 6 months postoperatively (2), and end-systolic preoperatively (3) and 6 months postoperatively (4).

investigations, we proposed SVR including surgery for VT as a surgical treatment option alternative to heart transplantation in this patient.

Operative Procedure

The aorta was cross clamped and the ventricle was incised parallel to the interventricular septum and LAD and a subtotal nonguided endocardectomy was conducted on the septum and anterior wall. Linear cryo lesions were applied at the edge of the endocardial resection. The left ventricle was reconstructed with a bovine pericardial patch and a sizing device (TRISVR; Chase Medical, Richardson, TX, USA) was used to optimize size and shape of the new ventricle.

Postoperative Evaluation

The operation and the early postoperative course were uneventful and the patient was discharged to his referring hospital after 14 days. Postoperative investigations were performed 6 months after surgery and a summary of the results are presented in the Table. Pre- and postoperative magnetic resonance imaging studies are shown in the Figure. At further follow-up 1 year after surgery, the patient is in good clinical condition and satisfied with the outcome of the operation.

DISCUSSION

Congestive heart failure as a consequence of ischemic heart disease is an increasing medical problem. For end-stage heart failure, heart transplantation is an effective therapeutic option, but donor shortage remains an important limitation.

SVR

After a myocardial infarction, a compensatory left ventricular (LV) dilatation is initiated in the surrounding myocardium, a process known as remodeling. This process may be beneficial in the early phase but eventually remodeling results in loss of normal LV elliptical shape and volume. The resulting spherical shape can lead to displacement of the papillary muscles and mitral regurgitation, which further promotes heart failure. LV volume is a very important predictor of prognosis after myocardial infarction [White 1987]. Indications for SVR include ischemic dilated cardiomyopathy or LV aneurysm with symptoms of heart failure, angina, and/or VT. The concept of SVR [Menicanti 2002] consists of complete revascularization to relieve ischemia, ventricular reconstruction to restore normal shape and volume to reduce LV wall tension and improve hemodynamics, and, when necessary, endocardectomy and cryoablation to remove substrate for ventricular arrhythmia [Dor 1994; Sartipy 2006]. Mitral valve repair is performed as needed.

SVR normally includes myocardial revascularization. However, the patient presented here had no coronary artery disease and no need for bypass surgery. The observed improvement in cardiac performance in this case must therefore be attributed solely to the reconstruction of the left ventricle. A decrease in end-diastolic and end-systolic volumes is expected after SVR [Schenk 2004; Yamaguchi 2005; Ferrazzi 2006]. Surgical treatment for heart failure should not be regarded as a last resort when other options have failed, but rather as an adjunct to medical and resynchronization therapy. Patients should be referred early to heart failure boards for a thorough assessment, and surgical treatment options other than heart transplantation should be considered. Results in patients with severe heart failure have improved recently [Athanasuleas 2004; Yamaguchi 2005], and therefore a more aggressive attitude toward early intervention is warranted. The current case illustrates that SVR, for some patients, can be an alternative to heart transplantation.

REFERENCES

Athanasuleas CL, Buckberg GD, Stanley AWH, et al. 2004. Surgical ventricular restoration in the treatment of congestive heart failure due to post-infarction ventricular dilation. J Am Coll Cardiol 44:1439-45.

Dor V, Sabatier M, Montiglio F, et al. 1994. Results of nonguided subtotal endocardiectomy associated with left ventricular reconstruction in patients with ischemic ventricular arrhythmias. J Thorac Cardiovasc Surg 107:1301-7.

Ferrazzi P, Matteucci ML, Merlo M, et al. 2006. Surgical ventricular reverse remodeling in severe ischemic dilated cardiomyopathy: the relevance of the left ventricu-

lar equator as a prognostic factor. J Thorac Cardiovasc Surg 131:357-63.

Menicanti L, Di Donato M. 2002. The Dor procedure: what has changed after fifteen years of clinical practice? J Thorac Cardiovasc Surg 124:886-90.

Sartipy U, Albåge A, Lindblom D. 2005. The Dor procedure for left ventricular reconstruction. Ten-year clinical experience. Eur J Cardiothorac Surg 27:1005-10.

Sartipy U, Albåge A, Stråât E, et al. 2006. Surgery for ventricular tachycardia in patients undergoing left ventricular reconstruction by the Dor procedure. Ann Thorac Surg 81:65-71.

Schenk S, McCarthy PM, Starling RC, et al. 2004. Neurohormonal response to left ventricular reconstruction surgery in ischemic cardiomyopathy. J Thorac Cardiovasc Surg 128:38-43.

White HD, Norris RM, Brown MA, et al. 1987. Left ventricular end-systolic volume as the major determinant of survival after recovery from myocardial infarction. Circulation 76:44-51.

Yamaguchi A, Adachi H, Kawahito K, et al. 2005. Left ventricular reconstruction benefits patients with dilated ischemic cardiomyopathy. Ann Thorac Surg 79:456-61.