ELSEVIER

Donor Mitral Valve Repair in Cardiac Transplantation

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ABSTRACT

Introduction. For many patients suffering from end-stage heart failure, heart transplantation remains the only hope for survival, but the shortage of donor organ is increasing. The growing number of patients awaiting heart transplantation has led many centers to expand the donor pool by liberalizing donor criteria, including advances in surgical techniques on the donor heart, such as valve repair.

Patients and Results. We subjected 4 donor hearts to bench repair of the mitral valve. The first heart was from a 35-year-old woman whose echocardiogram showed mild to moderate sclerotic leaflets. We performed a posteromedial commissurotomy and posterior annuloplasty. Transthoracic echocardiography at 57 months after transplantation demonstrated mild mitral regurgitation and no enlargement of VE. The second organ was from a 17-year-old woman with no history of heart disease and an echocardiogram that showed evidence of slightly sclerotic leaflets and mild mitral regurgitation. We performed a posterior annuloplasty. Echocardiography at 12 months demonstrated minimal mitral regurgitation. The third heart was from a 28-year-old woman with a normal echocardiogram. After harvesting, we found a torn head of the posterior papillary muscle, which was reimplanted. Two weeks later, the echocardiogram showed no mitral regurgitation. The fourth was from a 47-year-old woman with no history of heart disease and a normal echocardiogram. Examination before implantation showed central insufficiency, for which we performed posterior annuloplasty. Echocardiography at 12 months showed no mitral regurgitation.

Conclusion. An aggressive approach to use hearts from marginal donors expands the pool and decreases waiting time for patients who desire heart transplantation.

HEART TRANSPLANTATION remains the only hope for survival for many patients suffering from end-stage heart failure.[1] It has become a relatively common procedure, benefiting during the last decades from improvements in surgical techniques, immunosuppression, and postoperative medical care. However, the donor shortage and continuously growing number of patients hoping

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for heart transplantation has obliged many centers to expand the donor pool by liberalizing criteria and performing "minor" surgical techniques on the heart, such as coronary grafting and valve repair.[2–4] This report discusses our experience with 4 cases of bench repair of the donor mitral valve before orthotopic heart transplantation.

CASE REPORTS

Between November 2003 and May 2008 we performed 121 heart transplantations. A transthoracic echocardiogram was obtained from most donors. Further to this, the mitral and aortic valves were routinely tested on the table before transplantation. We observed moderate mitral valve disease among 4 donor hearts.

First Case

A 52-year-old man with a history of heart failure resulting from dilated cardiomyopathy underwent orthotopic heart transplantation in January 2004. The donor was a 35-year-old woman who died of a hemorrhagic cerebral accident. There was no history of heart disease; the auscultation and electrocardiographic findings were normal. Transthoracic echocardiogram (TTE) showed evidence of mildly to moderately sclerotic leaflets with mild mitral regurgitation and no evidence of stenosis. Otherwise, there was good valve motion. Regional and global myocardial contractility was unimpaired. Because there were no other contraindications to heart donation, we decided to proceed with the transplantation. Upon arrival of the heart at our center, the mitral valve was carefully inspected. The free edges of the leaflets were mildly fibrosed and retracted, and the posteromedial commissure was moderately fused, as were the corresponding chordae tendineae. The valve was tested with injection of cold saline into the left ventricle after the aorta was clamped and there was a central jet of regurgitation caused by incomplete coaptation of the leaflets. Because the valve disease was more significant than anticipated, it was decided to proceed with bench-repair of the mitral valve. We performed a posteromedial commissurotomy with division of the fused chordae tendineae. Additionally, annuloplasty was performed to increase the area of leaflet coaptation and prevent future annular dilatation. The posterior annulus was plicated with a double continuous 3-0 polyester suture, passed from trigone to trigone. Where the valve was tested again, there was good coaptation of the leaflets. This procedure was facilitated by the excellent exposure. The heart was then implanted using a bicaval technique. The aortia cross-clamping time was 35 minutes. Ischemic time was 84 minutes. Intraoperative transesophageal echocardiography (TEE) after completion of the procedure revealed minimal mitral regurgitation. Donor heart function was excellent. There was no transvalvular gradient, as determined by direct measurement of simultaneous left ventricular and left atrial pressures. TTE at 57 months showed mild mitral regurgitation, ejection fraction (EF) of 0.74 and left ventricular diastolic diameter of 59 mm. He is functional class of NYHA I.

Second Case

A 52-year-old woman with dilated cardiomyopathy underwent transplantation in September 2007. The donor was a 17-year-old man with no history of heart disease. TTE showed normal ventricular function but evidence of slightly sclerotic leaflets with mild mitral regurgitation. As there were no other contraindications to donation, we continued to proceed with transplantation. On the bench, the valve was tested as described, but no significant regurgitation was detected. However, there was mild annular enlargement; a posterior annuloplasty was performed as described to increase the area of coaptation and prevent future annular enlargement. The valve was tested again, showing good coaptation of the leaflets. The aortic cross-clamp time was 45 minutes and the ischemic time 84 minutes. Intraoperative TEE revealed minimal mitral regurgitation. Donor heart function was excellent. Follow-up by TTE at 12 months after heart transplantation showed minimal mitral regurgitation, EF of 0.70 and LVdd of 40 mm. He maintains an unrestricted lifestyle.

Third Case

A 50-year-old man with dilated cardiomyopathy underwent orthotopic heart transplantation in September 2007. He was in the intensive care unit in NYHA class IV and heavy inotropic support. The donor was a 22-year-old man with no history of heart disease and a normal TTE. He suffered brain death after a motor vehicle accident. On the bench, the mitral valve showed significant eccentric insufficiency owing to incomplete coaptation of the mitral leaflets. We found a torn head of the posterior papillary muscle, which was reattached with a 4-0 polypropylene suture supported by teflon pledgets and we performed a partial posterior annuloplasty. The ischemic time was 63 minutes. Intraoperative TEE revealed minimal mitral regurgitation. Donor heart function was good. After 2 weeks, the TEE showed no mitral regurgitation. The patient developed a severe thrombocytopenia resistant to treatment, finally expiring due to a hemorrhagic cerebral accident.

Fourth Case

A 71-year-old man with ischemic cardiomyopathy was transplanted in January 2008. The donor was a 47-year-old woman with no history of heart disease and a normal TEE. The mitral valve was apparently normal but during testing showed central insufficiency owing to moderate annular dilatation, which was corrected by a posterior annuloplasty. The patient is clinically well, in NYHA functional class I, at 9 months after transplantation and TEE showed no regurgitation with LVdd of 41 mm and EF of 0.65.

DISCUSSION

Ecocardiography, which is now available in most centers, is an excellent tool to evaluate a donor heart. It has led to the discovery of mitral valve disease among potential donor hearts, which for some authors is a contraindication to heart transplantation. In some cases, mild mitral regurgitation may be underestimated owing to low afterload from loss of sympathetic peripheral vascular tone, or overestimated because of transient ventricular dysfunction.[5] In contrast, the natural history of mitral disease is difficult to define because the etiology is variable; mitral disease may be mild and nonprogressive for many years. Left ventricular function, an important determinant of symptoms and survival, deteriorates at a variable rate.

After heart excision, the mitral apparatus can be visualized on the bench and tested directly with the left atrium open. We stress the importance of visual inspection as a final assessment performed by the surgeon in the operating room. The decision to use a heart with mitral valve disease in these cases was determined by the degree of disease, but in some cases it may be determined by the urgency of the

transplantation, as happened with our third case. In these situations, our large experience in mitral valve repair was instrumental in the decision making.[6] We expect these "marginal" hearts to behave normally. So far, this appeared to be the case in the four patients. Other surgeons have used similar approaches, but only isolated cases have been reported.[2,4,7] We have also previously published the first case in this series.[8]

In conclusion, final assessment of the mitral valve performed by the surgeon in the operating room proved valuable. Considering our experience with mitral valve repair, we believe that we were justified to proceed in these situations, as a means to expand the donor pool.

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