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### Biopsy Negative Left Ventricular Dysfunction After Cardiac Transplantation: Outcome and Role of Enhanced Immunosuppression

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To evaluate the incidence and etiology of LV dysfunction (LVD) occurring without cellular rejection after cardiac transplantation (CT), we retrospectively reviewed all echocardiograms from 93 consecutive CT recipients at Massachusetts General Hospital. A decrease in LVEF to <0.45 in the absence of secondary causes occurred in 15 patients (pts) (13 M, 2 F). RV biopsies (bx) showed moderate cellular rejection (ISHLT grade 2 to 3A) in 4/15 patients; 3/4 pts improved following therapy with enhanced immunosuppression (ENIM).

Diagnostic studies in the 11 pts without cellular rejection included LV bx (5 pts) and immunofluorescence staining for vascular rejection (4 pts); all were negative. Coronary angiography was performed in 10/11 pts and revealed mild distal disease in 2 pts. These 2 pts died within four months of angiography, and had diffuse coronary artery disease (CAD) at autopsy. Change in LVEF over time in the 9 pts without CAD were:

	Initial (n = 9)	LVD (n = 9)	Current (survivors) (n = 6)
Months After CT	0.4 ± 0.3	8.3 ± 7.8	47.8 ± 15
LVEF	0.64 ± 0.07	0.31 ± 0.09	0.53 ± 0.09

LV function improved spontaneously in 1 pt. The remaining 8 pts received ENIM for presumed rejection. Therapy included solumedrol in 7/8 pts, OKT3 in 4/8 pts, and actinomycin 2/8 pts. LVEF improved in 5/8, but returned to initial baseline only in 2 pts; 3 pts died within 2 months of presentation, despite therapy.

In summary: 1. LV dysfunction, unexplained by cellular rejection or angiographic evidence of coronary disease, occurred in 10% of pts within 2 years of CT. 2. Despite negative histology, LVEF improved in 62% of these pts treated with enhanced immunosuppression.

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### Biocompatible Mechanical Left Ventricular Support: Potential Alternative to Transplantation

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Use of mechanical circulatory support has been limited by its associated bleeding and thrombotic complications. Blood contact with an artificial surface results in a well-defined pattern of hematologic alterations. The TCI HeartMate® left ventricular assist device (LVAD) is an implantable circulatory support pump currently used as a bridge to transplantation. Its textured blood contacting surfaces result in a formation of an adherent pseudoneointimal lining which eliminates the direct interaction of blood elements with the artificial surface. To determine if this biological lining could mitigate the stereotypical blood-synthetic surface interactions, we studied eight patients who underwent implantation at our institution over a 10 month period from 5/93 to 3/94. Seven of the 8 patients were bridged to transplantation. Three patients were transplanted within 10 days and one month data could not be obtained. Hemodynamic and hemostatic parameters (mean ± sd) were studied as follows:

	Pre-implant	POD 7	POD 28
Cardiac index (l/min/m <sup>2</sup> )	1.8 ± 0.7	3.2 ± 0.4	3.1 ± 0.5
Systolic BP (mmHg)	75.9 ± 6.8	125.8 ± 9.7	130.4 ± 8.1
Hemoglobin (mg/dl)	7.4 ± 1.8	8.2 ± 1.6	9.6 ± 2.0
Plasma free hemoglobin (mg/dl)	15.4 ± 1.7	6.4 ± 2.3	6.8 ± 1.9
Prothrombin time (sec)	14.2 ± 1.1	13.4 ± 0.7	13.3 ± 0.7
Partial thromboplastin time (sec)	56.7 ± 15.9	31.8 ± 4.8	37.6 ± 11.9
Platelet count (×10 <sup>3</sup> /cu mm)	250 ± 81	269 ± 63	325 ± 37

*In vitro* platelet reactivity to the agonist ADP remained normal pre and post implantation. Average perioperative blood requirements included PRBC, 3.3 ± 1.3 units; platelets, 2.3 ± 4.5 units; fresh frozen plasma, 2 ± 1.9 units. No blood products were required after postoperative day 2.

We conclude that TCI LVAD support improves hemodynamics and can bridge patients in pre-implant cardiogenic shock to transplantation. Furthermore, no red cell destruction or hemostatic and thrombotic complications were observed despite one month of support without anticoagulation therapy. Therefore, as the donor shortage continues, LVADs with biocompatible surfaces may provide an alternative to cardiac transplantation.

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### Changing Profile of the Cardiac Donor

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As the demand for organs for cardiac transplantation has increased, donor criteria have evolved. We reviewed the characteristics of 190 cardiac donors from 1983 to 1993 to identify trends in donor profile and to determine if recipient outcome were affected. Donors were divided into early (1983-1987; n = 86) and late (1988-1993; n = 104) groups according to operative era. While mean donor age has not changed significantly (24 ± 0.9 to 26 ± 1.3 years), the proportion of donors older than 40 years has increased from 1% (1/86) to 15% (16/104) (p < 0.001). Trauma was the cause of death in 93% (80/86) of the early group and 65% of the late group (68/104) (p < 0.001); in the total series, donors older than 40 years were less likely to have died from trauma (31%; 5/16) than younger donors (83%; 143/173) (p = 0.001). The proportion of out-of-state donors has fallen from 71% (61/86) to 27% (28/104) (p < 0.001), while the proportion of ethnic minorities increased from 10% (9/86) to 25% (26/104) (p < 0.001). There have been no significant changes in gender profile; males constituted 78% (67/86) of the early group and 72% (75/104) of the late group. Five year survival after transplant was not predicted by donor age, mode of donor death, recipient age, or recipient UNOS status. In summary, donors in the current era are more likely (1) to be older, (2) to be within the state, (3) to come from an ethnic minority, and (4) to have died from causes other than trauma when compared to donors from the earlier era.

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### Echo-Doppler: Miscellaneous Topics

Tuesday, March 21, 1995, 3:00 p.m.-5:00 p.m.  
Ernest N. Morial Convention Center, Hall E  
Presentation Hour: 3:00 p.m.-4:00 p.m.

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### Adverse Prognosis of an Unsuccessful Mitral Valve Repair Immediately Followed by Valve Replacement: Value of Echocardiography

Irene M. Hellems, Els G. Pieper, Anita C.J. Ravelli, Johannes P.M. Hamer, Wybren Jaarsma, Emile C. Cheriex, Henry A. van Swieten, Cathinka H. Peels, Jan G.P. Tyssen, Cees A. Visser, ESMIR (Echocardiographic Selection of patients for Mitral valve Repair). *Interuniversity Cardiology Institute (ICIN), Utrecht, The Netherlands*

To determine the risk of an unsuccessful mitral valve repair followed by replacement we prospectively studied 180 patients (pts) who underwent mitral valve surgery because of severe regurgitation using univariate analysis of preoperative clinical, echocardiographic and surgical characteristics.

Clinical and echocardiographic risk factors for unsuccessful repair were: female gender (relative risk (RR) 2.56\*), concomitant mitral stenosis (RR 4.63\*), restricted leaflet mobility (RR 2.48\*), normal left ventricular enddiastolic diameter (RR 3.42\*) and prediction of a replacement by echo (RR 4.74\*).

Surgical risk factors were: restricted leaflet mobility (RR 4.0\*), concomitant mitral stenosis (RR 4.83\*) and aneurysm of the left ventricle (RR 3.17\*).

In 12 pts the result of the repair procedure was deemed unsatisfactory after visual inspection and in 9 pts the replacement procedure was carried out on the basis of intraoperative echo assessment of residual regurgitation. One year mortality of these 21 patients was 24% and the RR of death was 2.15\* compared to primary replacement pts. (\*p < 0.005)

#### Conclusions:

1. Risk factors for an unsuccessful repair can readily be identified by pre-operative echocardiography and determination of gender.

2. Unsuccessful mitral valve repair followed by valve replacement during the same surgical procedure is related to a substantial one-year mortality.

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### Digitally Compressed Echocardiograms Offer Superior Image and Diagnostic Quality to Video Tape: Results of the Digital ERA (Echo Record Access) Study

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Routine use of digital echocardiography has many advantages but requires inordinate amounts of computer memory. Storing compressed images would reduce memory needs; however, image quality (IQ) and diagnostic quality (DQ) may suffer. To gather data from a wide variety of echo users, attendees of the 1994 American Society of Echocardiography Scientific Sessions were asked to participate in a study comparing the IQ and DQ of digital images against images digitized from video tape of the same structures.