

# Coronary arteriographic findings in cardiac transplant recipients

James F. Silverman, M.D.  
Edward B. Stinson, M.D.  
Charles P. Bieber, M.D.  
Lewis Wexler, M.D.

*Stanford, California*

Coronary arteriography is performed routinely on a yearly basis in cardiac transplant recipients at Stanford University Hospital. It is the only method available to determine the status of the coronary arteries in this unusual group of denervated, angina-free patients. Since coronary artery disease is a leading cause of late death in cardiac transplant recipients, the coronary arteriograms have become important diagnostic and prognostic tests.

As of 1979, 174 cardiac transplants have been performed in 161 patients. The number per year has increased steadily from 10 to 15 in earlier years to 31 in 1978. This increase is due in part to the availability of donor hearts. Hearts can be removed and cooled in one city and then transported to Stanford by air for insertion in an appropriate recipient. In this group of 161 patients, there were 74 one-year survivors (91% rehabilitated) and 67 are still alive (one week to 9 years). The current one-year survival rate is 65%; 50% survive for 5 years.

There were 178 coronary arteriograms performed in patients surviving at least one year. Seventy-one patients had 127 normal studies and 18 patients had a total of 51 abnormal studies with findings of coronary artery disease. In the latter group, seven arteriograms were abnormal at the first study; 11

were normal initially, but later became abnormal: seven in the second, three in the third, and one in the fourth year. Evaluation of this 18-patient cohort yielded the following correlations with accelerated coronary artery disease.

Factors not affecting were (1) warfarin therapy, (2) preoperative diagnosis, and (3) type of therapy for rejection episodes.

Factors affecting were (1) HLA incompatibility (A locus), (2) donor age, (3) elevated cholesterol, (4) elevated triglyceride levels, and (5) severe graft rejection.

HLA incompatibility between donor and recipient may be the most critical factor associated with the development of coronary artery disease. The highest incidence of graft atherosclerosis occurred in patients totally incompatible for both HLA-A locus antigens (14/37 or 38%). Coronary artery disease has not been detected in eight patients with A-locus compatibility. Partial matching appears to reduce the incidence of coronary artery disease (2/18 or 11%). Also, coronary artery disease was found ear-

lier in those totally mismatched versus those partially matched. Theoretically, mismatching leads to cyclical or low-grade continuous rejection causing progressive intimal injury represented by endothelial damage with microthrombosis. Cellular organization with repair results in an intimal proliferative lesion. Abnormal lipid metabolism in proliferative intimal layers yields atheromatous changes identical to those seen in patients with long-standing coronary artery disease. Pathologic and angiographic data are available to document these late-stage findings. The intermittent preatheromatous phase, which may also produce vessel obstruction, can also be characterized pathologically and angiographically.

Yearly coronary arteriographic studies have been useful not only for following the progression of disease, but also for predicting which patients should have retransplantation prior to the development of malignant occlusive coronary disease. As donor hearts become more readily available, retransplantation has become a frequent therapeutic modality.