Insulin-dependent diabetes mellitus ranks as one of the major disease entities in the world. Six hundred thousand new patients are diagnosed each year in the United States. Prior to the introduction of insulin, the life expectancy of diabetic patients was about two years from the time of diagnosis. In spite of insulin therapy, the morbidity resulting from microangiopathy still exists. The National Commission on Diabetes in the United States has reported that insulin-dependent diabetes mellitus patients are 25 times more prone to blindness, 17 times more prone to renal disease, five times more afflicted with gangrene, and twice as often exposed to heart disease and stroke than nondiabetic individuals. Diabetes mellitus is the cause of 260,000 deaths annually and has a health care cost of $18 billion.

The advent of dialysis did not significantly lessen the challenge presented by patients with end-stage diabetic nephropathy. There are twice as many deaths in diabetic patients on dialysis as compared with nondiabetic patients, and one-year diabetic patient survival rate on dialysis as low as 40% has been recorded [1]. Similarly, only 42% of patients receiving cadaveric renal transplants were alive at two years and only one-third had a functioning graft [2].

Due to the poor minute-to-minute control of hyperglycemia, lesions associated with diabetes mellitus have continued to progress despite the most efficient exogenous insulin delivery system currently available [3]. Lee et al. [4] showed that kidney transplants into diabetic rats developed vascular changes of diabetes, whereas kidneys from diabetic donors grafted to nondiabetic hosts showed regression of vascular lesions. Abouna later confirmed these findings in clinical transplantation [5].

It would be logical that transplantation of normally functioning islets of Langerhans should correct the metabolic abnormalities, and if performed early would prevent the development of severe secondary complications. There has been remarkable progress in the field of transplantation of the vascularized pancreatic graft during the last few years, and results are comparable to those reported for other organs such as kidney, heart, and liver. In this chapter, the Iowa experience with bowel-drained pancreas transplants will be reviewed, concentrating on the areas of particular interest and controversy.

**Indications**

Although some centers have carried out pancreas transplantation to nonuremic diabetics...
[6–9], because of the hazards of the immunosuppressive treatment most groups have offered the procedure to the uremic patients who are obligated to receive immunosuppression for their renal transplants [10]. However, as the current immunosuppressive therapy is safer and more specific and as reversal of secondary complications has been documented in humans [6, 9] indications for pancreas transplantation are liberalized to include complication-prone patients [10–12], e.g., those who present with brittle diabetes, joint stiffness, progressing peripheral vascular disease, and accelerated nephropathy and retinopathy. This management should be instituted early before diet restriction and secondary complications of diabetes mellitus lead to a catabolic and debilitated patient.

Patient Selection

Because major complications have been related to cardiovascular events and patients over the age of 40 have not fared well, cardiomegaly or impaired cardiac function has been considered a sufficient criterion to exclude patients from transplantation (Joint Scandinavian Report [13]). Patients with a prolonged history of hypertension or those who are unable to generate a 5% increased ejection fraction after a thallium radionuclide ventriculogram stress test should receive a careful cardiac evaluation. A normal isotopic ventriculogram is all that is necessary for the young, asymptomatic candidate for either kidney or pancreas transplants. For the patient considering a simultaneous kidney and pancreatic transplant procedure, a normal coronary angiogram is required. Significant disease should be corrected before accepting patients for either renal transplant or sequential renal and pancreatic grafting. Cardiac evaluation is summarized in Figure 15-1.

Between March 1984 and July 1986, 30 pancreas transplants with enteric drainage were performed in 28 patients whose ages ranged from 22 to 47 years with a mean of 33.2 years. Only one patient had a prior coronary artery bypass. Almost all patients had a normal resting and exercise isotopic ventriculogram. The mean number of antigens matched for the pancreas was 0.57 HLA-DR antigen (range 0–2) and 1.0 HLA-A, and B antigens (range 0–4), respectively. Seven patients received a pancreas after successful kidney transplants, and 21 patients had simultaneous pancreatic and kidney transplants. One patient in each group received a second pancreas graft; the first transplants were lost, one because of perioperative failure to reperfuse and the other due to postoperative venous thrombosis.