Simultaneous Renal and Intraperitoneal Segmental Pancreatic Transplantation: The Zürich Experience

Dieter Baumgartner, M.D., and Felix Largiadèr, M.D.

Chirurgische Klinik A, University Hospital, Zürich, Switzerland

Simultaneous renal and interperitoneal segmental pancreas transplantation with a prolamine-occluded duct was performed in 15 type I diabetics with end-stage renal failure. Four pancreas grafts are currently functioning at 2 days, 2 weeks, 30, and 39 months. In 3 patients, both organs were rejected within 6 months; 2 patients died with functioning grafts at 36 hr and 2 months. In 6 patients pancreatic failure for nonimmunological reasons did not jeopardize the simultaneous kidney graft. No adverse effects of duct occlusion with prolamine could be demonstrated. It is concluded that simultaneous renal and pancreatic transplantation is the method of choice in most patients with complicated type I diabetes and end-stage renal failure.

Our experience with pancreatic transplantation in patients with type I diabetes can be divided into 3 phases. Initially, in 4 patients, vascularized pancreases or pancreatic segments were transplanted extraperitoneally and drainage of the exocrine pancreas to a jejunal Roux-en-Y loop was established. Unacceptably high complication and mortality rates led to phase 2, in which 7 patients were treated with intraportal or intrasplenic injection of pancreatic microfragments. This method proved to be safe but rather ineffective since only one of these patients became insulin independent for a prolonged period of time. Results with both methods have been described elsewhere [1, 2]. The present report will focus on a subsequent series of 15 patients treated since 1980 by the same technique of intraperitoneal segmental pancreas transplantation with duct obliteration and simultaneous renal transplantation.

Material and Methods

Fifteen type I diabetics (7 men, 8 women, 28–45 years of age) with secondary complications who had required insulin for 16 to 30 years were accepted to the program. All patients had end-stage renal failure. Nine patients were on continuous ambulatory peritoneal dialysis (CAPD); 3 patients on hemodialysis, and 3 patients did not yet require dialysis at the time of transplantation. Other secondary diabetic complications in these patients were retinopathy in 11, total blindness in 2 patients, neuropathy in 13, and severe angiopathy in 2. All patients suffered of varying degrees of chronic obstruction as a sign of visceral neuropathy. Two patients with severe cardiovascular problems on hemodialysis were transplanted on an emergency basis. All other recipients were selected according to our standard criteria for renal transplantation. Details of organization and organ procurement have been described elsewhere [3]. Pancreatic segments based on the splenic vessels were transplanted intraperitoneally to the left iliac vessels through a midline or left paramedian incision, the graft being placed in the pouch of Douglas. The pancreatic duct was cannulated and injected with 4 to 6 ml of prolamine which had been brought to a temperature of 39°C to ensure low viscosity and easy handling. The main pancreatic duct and bleeding vessels on the cut surface of the pancreas were oversewn.

The rectovaginal or rectovesical space was drained for 3 days to 4 weeks by a soft silicone rubber drain or by a Tenckhoff catheter previously used for CAPD. A simultaneous renal transplant was placed in the right iliac fossa according to our standard technique. Azathioprine and prednisone were used for immunosuppression. Dosage of azathioprine was 300 mg preoperatively and on the first 2 postoperative days, followed by 2.5 mg/kg per day on subsequent days. In acute tubular necrosis with anuria, the dose was reduced to 1.5 mg/kg per day. In leukopenic patients, the dose was adjusted according to white blood count. Fifty milligrams of prednisone were given intraoperatively; postoperatively patients received 50 mg/day for 3 to 5 weeks. Subsequently, the dose was tapered according to
function and the immunological situation over weeks and months to a final dose of 15 mg/day. Standard antirejection treatment for renal transplantation, consisting of doses of 0.5 to 1 g prednisolone intravenously per day in some cases combined with antilymphocyte globulin (ALG) 30 mg/kg per day and graft irradiation (3 × 150 cGy), was used during rejection episodes. Deterioration of renal function was a consistent early sign in rejection episodes which always affected both organs. Symptoms and antirejection treatment have been described in more detail elsewhere [5].

Results

Initial graft function was good in 11 patients with normalization of blood glucose within 6 to 24 hr. In 4 of these patients, the pancreatic grafts were lost for nonimmunological reasons: 2 from patient death from cardiovascular causes at 36 hr and 2 months, respectively, 1 from vein thrombosis after 48 hr, and the fourth, with a cold ischemia time of 11 hr, from a slow deterioration of endocrine function accompanied by recurrent exocrine fistulas. This graft was removed after complete loss of endocrine function at 10 months. Its histological appearance was reminiscent of that of a chronic sclerosing pancreatitis. In the latter 2 patients, kidney function remained excellent. In 3 patients, exogenous insulin administration was resumed because of graft rejection at 1½, 2, and 4 months, respectively. The kidney was rejected concomitantly in all 3 and dialysis was reinstituted within 8 weeks of pancreatic rejection. Four patients have functioning grafts at 2 days, 2 weeks, 30 months, and 39 months; however, the patient with the longest surviving graft is in premature renal failure caused by de novo glomerulonephritis in the renal transplant. In 4 patients the pancreatic grafts never had any useful endocrine function. In 2 cases, severe necrotizing pancreatitis developed, secondary to inadequate ductal filling with prolamine in 1 and to kinking of a large graft in the other, necessitating graft removal at 10 and 24 days, respectively. In 1 patient cold ischemia was 23 hr and in another there was prolonged warm ischemia due to intraoperative arterial thrombosis. In all 4 of these patients, kidney function remained totally unaffected by the process in the pancreas. In one patient, however, bleeding from the splenic to iliac artery anastomosis, secondary to peritonitis after removal of the CAPD catheter, contributed to a fatal outcome.

Discussion

In experienced hands, segmental pancreatic transplantation has become a safe and effective procedure, the main contributing technical improvements being intraperitoneal placement of the graft and better methods for handling the exocrine pancreas. While the importance of an adequate communication of the graft bed to the peritoneal cavity is generally accepted, the question of whether drainage of the exocrine pancreas is preferable to prophylactic elimination remains to be settled. It has been claimed that duct drainage to the small intestine is more physiological [6] and, therefore, prevents pancreatic fibrosis. However, the results of pancreatic transplantation with duct occlusion in experienced centers are equal to those with drainage [7, 8]. As demonstrated by the latest pancreas transplant registry report, sudden loss of function with pancreatic fibrosis can occur with both techniques [8]. In our own experience inadequate duct occlusion amounting to duct ligation resulted in acute pancreatitis in one case. Other, especially late, ill effects of duct occlusion with prolamine were not encountered. Bleeding from a vascular anastomosis in a primarily nonfunctioning graft has contributed to the death of 1 of our patients. We have since adopted the policy of removing grafts lost for nonimmunological reasons; however, rejected grafts may be left in place safely. None of the nonimmunological complications of the transplanted pancreas affected survival of the simultaneous kidney graft and our patient who acquired glomerulonephritis in his renal transplant has excellent pancreatic function. Thus, one organ is not jeopardized by nonimmunological complications in the other. On the other hand, deterioration of renal function was a consistent and early sign of rejection processes in both organs. These findings, which have been confirmed by other authors [9], suggest that simultaneous transplantation of the pancreas and the kidney is the method of choice in type I diabetics with end-stage renal failure. However, the donor pool for pancreatic grafts being much smaller than the donor pool for kidney transplants, primary transplantation of the kidney alone followed by transplantation of the pancreas may be advisable in patients with rare blood types who might otherwise remain on the waiting list for unacceptably long periods of time.

Résumé

Une transplantation segmentaire intrapéritonéale du pancréas avec occlusion canalaire et une greffe rénale ont été pratiquées simultanément chez 15 patients diabétiques insulino-dépendants en insuffisance rénale terminale. Quatre greffes pancréatiques sont actuellement fonctionnelles avec un recul de 2 jours, 2 semaines, 30 et 39 mois. Chez 3 patients, les 2 greffons ont été rejetés dans les 6