

## Almost 200 Pancreas Transplantations: A Single-Center Experience

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### ABSTRACT

Introduction. Pancreas transplantation is the most effective and physiological method of treatment of patients with diabetes. It restores proper insulin secretion and helps to achieve a metabolic balance by eliminating the need for exogenous insulin. It can also prevent life-threatening diabetic complications. Pancreas transplantation can also reduce cardiovascular risk factors and can prevent the evolution of some of the chronic diabetic complications.

Patients and Methods. From November 2004 until September 2017, 193 pancreas transplantations were performed in the Clinical Department of Gastroenterological Surgery and Transplantation in Central Clinical Hospital of the Ministry of the Interior and Administration in Warsaw. All medical records of the recipients who underwent pancreas transplantation in our center were retrospectively analyzed.

Results. Among 193 transplantations, we performed 159 simultaneous pancreas kidney transplantations (SPK), 25 pancreas transplantations alone (PTA), and 9 pancreas after kidney transplantations (PAK). The overall patient survival was 87% at 1 year and 85% at 3 and 5 years after transplantation. At 1 year after transplantation, 72% patients had a fully functioning pancreas graft; at 3 years, 68%; and at 5 years, 63%. Kidney graft survival was 87% at 1 year and 85% at 3 and 5 years after transplantation.

Conclusions. Pancreas transplantation is an established treatment for long-lasting diabetes. It is a complicated procedure, which requires experience and multidisciplinary approach. It is an operation with a relatively high complication rate and should be performed in highly specialized centers.

**P**ANCREAS transplantation is an established method in long-lasting treatment of insulin-dependent diabetes mellitus, which provides the patient with the best possible physiological metabolic balance. It not only restores proper insulin secretion and provides the patient with insulin independence, but also can prevent life-threatening diabetic complications such as severe hyperglycemia, which can occur with acidosis and/or coma or hypoglycemia episodes, especially in the absence of awareness or symptoms. It is also proven that pancreas transplantation reduces cardiovascular risk factors and can stop the progression of some of the chronic diabetes complications such as retinopathy and neuropathy as well as lower the incidence of hemostatic abnormalities, cardiocerebrovascular events, and mortality and improve cardiac function, lipid profile, and blood pressure [1].

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#### PATIENTS AND METHODS

From November 2004, when the pancreas transplant program was implemented in the Central Clinical Hospital of the Ministry of the Interior and Administration in Warsaw, to September 2017, 193 patients underwent pancreas transplantation in our department. We analyzed and carried out a retrospective statistical analysis of the available medical records. Patient and graft survival was analyzed using the Kaplan–Meier method.

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#### RESULTS

Among 193 transplantations, we performed 159 simultaneous pancreas kidney transplantations (SPK), 25 pancreas transplantations alone (PTA), and 9 pancreas after kidney transplantations (PAK).

Our group of patients consisted of 110 men and 83 women with a mean age of 38 years. Most of our patients had diabetes type 1 (99.97%) and the mean time of diabetes evolution was 24.45 years. One patient after transplantation suffered from diabetes type 2 (0.01%). Three patients had diabetes due to previous pancreatectomy (0.02%). Most of our patients already had advanced kidney complications and required dialysis, mainly hemodialysis (61%), for a mean time of 21.83 months; 25% of the patients were treated with peritoneal dialysis and 14% of the treatment was preemptive. The mean body mass index (BMI) of the recipients before the operation was 23.14 kg/m<sup>2</sup> (Table 1).

All the organs were obtained from heart-beating cadaveric donors, usually in conjunction with multiple organ retrieval. The majority of the donors were men (67%) who had sustained brain injury, with a mean age of 33 years. A summary of the donors' parameters is provided in Table 2.

The vast majority of recipients received induction therapy with thymoglobulin (6–7 mg/kg). Maintenance therapy consisted of mycophenolate mofetil (2 g/d), tacrolimus (0.1 mg/kg per day), and prednisone that was started intraoperatively and was decreased later with time to a 5 mg dose. Antibiotic prophylaxis consisted of piperacillin with tazobaktam and antifungal fluconazole, and later, within 10 to 14 days after surgery, the antiviral ganciclover and cotrimoxazole prophylaxis were administered.

Before the operation, the pancreas graft was reconstructed on the back table. The iliac artery bifurcation Y graft was anastomosed with the superior mesenteric and splenic artery. In the great majority of the cases, the portal vein was extended with the donor's iliac vein [2,3]. Through the longitudinal incision both spaces for the grafts could be achieved. The graft artery was anastomosed end-to-side to the right iliac artery and the graft vein was anastomosed to the left iliac vein. We performed a venous anastomosis with

Table 1.	Basal	Characteristics	of	the	Recip	ient

Feature	Study population $N = 193$
Mean age (y)	$38\pm8$
Sex ratio (M:F)	110 (57%):83 (43%)
Type of DM	99.97% DM type 1 (n = 189)
	0.01% DM type 2 (n = 1)
	0.02% DM after pancreatectomy
	(n = 3)
Duration of DM (y after onset)	$\textbf{24.45} \pm \textbf{8.80}$
BMI (kg/m <sup>2</sup> )	23.07 kg/m $^2\pm$ 2.98
Type of dialysis	
Preemptive	14%
Peritoneal dialysis	25%
Hemodialysis	61%
Duration of dialysis (mo)	25 + 19

Abbreviations: BMI, body mass index; DM, diabetes mellitus.

Table 2. Basal Characteristics of the Donor

Feature	Study population N = 193
Sex ratio (M:F)	67%:33%
Mean donor age (y)	$33\pm10$
Donor BMI (kg/m <sup>2</sup> )	25.09 kg/m $^2\pm$ 3.79
Cause of death	
Intracranial hemorrhage	49%
Traumatic brain injury	33%
Anoxic brain damage	13%
Other	5%
Mean serum creatinine (mg/dL)	1.42 mg/dL $\pm$ 1.06
Cold ischemic time	6 h 41 min $\pm$ 2 h 52 min

the inferior vena cava in only 3 cases. The kidney was transplanted in the retroperitoneal left iliac fossa anastomosing the kidney graft vessels to the external iliac vessels of the recipient. The mean time of the SPK transplantation was 176 minutes  $\pm$  44, PAK 142 minutes  $\pm$  30, and PTA 119 minutes  $\pm$  30.

In our center we try to ensure the cold ischemia time (CIT) is less than 12 hours. The various complications that may occur due to prolonged CIT, such as graft thrombosis and graft pancreatitis, have been reported by many authors [4,5]. The mean CIT in our center was 6 hours 41 minutes  $\pm$  2 hours 52 minutes.

The mean hospital stay after the operation was 27 days  $\pm$  18 days. After release from the hospital, the patient was moved to regular ambulatory care.

Mortality rates were 13% at 1 year and 15% at 3 and 5 years respectively after transplantation, and were was most commonly due to infection and septic complications. The inhospital mortality was 62%. In the SPK group the survival rates were 86%, 83%, and 83%, whereas in the PTA group they were 96%, 96%, and 96% at 1, 3, and 5 years after transplantation. We reported no deaths in the PAK group (Fig 1). The most critical period for the survival of the patient and as well as the graft was the first year after transplantation.



**Fig 1.** Patient survival. Abbreviations: PAK, pancreas after kidney transplantation; PTA, pancreas transplantation alone; SPK, simultaneous pancreas kidney transplantation.

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