Pancreas Transplantation for Patients with Type 1 and Type 2 Diabetes Mellitus in the United States: A Registry Report

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KEYWORDS

• Pancreas transplantation • Patient survival • Graft function • Technical failure
• Immunologic graft loss • Type 1 diabetes • Type 2 diabetes

KEY POINTS

- The registry shows improvement in patient survival and graft function.
- Trends show an increase in older recipients.
- Trends show an increase of younger donors.

Diabetes is a pandemic disease of the modern era. In the United States, 30.3 million people have diabetes, which represents 9.4% of the population. Type 1 diabetes makes up between 5% and 10% of those cases.[1] Diabetes is the seventh leading cause of death in the United States and it is among the main reasons for cardiovascular disease, stroke, amputation, and endstage renal disease. Despite the prevalence, morbidities, and the associated financial burden, treatment options have not changed very much since the introduction of injectable insulin. For patients who are not successfully treated with conservative insulin therapy and who developed brittle diabetes, a treatment option is pancreas transplantation.

From December16, 1966 to December 31, 2016, more than 50,000 worldwide and more than 30,000 pancreas transplants in the United States were reported to the International Pancreas Transplant Registry. Since the first transplant, tremendous progress was made in patient and graft survival. Pancreas transplantation is still the only method to achieve long-term insulin-independence and euglycemia. However, although the numbers increased steadily until 2004, the number of pancreas transplants then declined significantly (**Fig. 1**). This article analyses developments in pancreas transplantation in the United States between 2001 and 2016. This time

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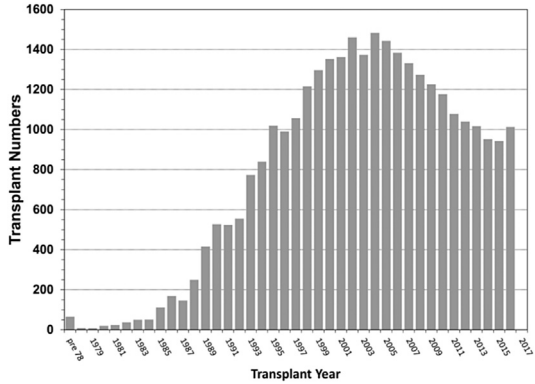

Fig. 1. Annual number of US pancreas transplants reported to IPTR/UNOS from 1966 to 2016.

period encompasses the peak of pancreas transplantation (2001–2005), the period of decline (2006–2010), and the period of slight recuperation (2011–2016). An overview of changes in patient and donor characteristics and outcome is given.

METHODS

All 16,419 patients with type 1 and type 2 diabetes mellitus who received a primary pancreas and/or pancreas and kidney transplant are included in this study. During this time, a total of 13 living donor pancreas transplants were performed (9 simultaneous pancreas and kidney [SPK], 1 pancreas after kidney [PAK], and 3 pancreas transplant alone [PTA]), which are were excluded from this study. All patients had a follow-up time of at least 6-months posttransplant.

Pancreas graft function was defined as complete insulin-independence. Partial function or dying with a functioning graft was counted as failure when not mentioned otherwise. Kidney graft failure was defined as being back on dialysis or dying with a functioning graft.

To measure the impact of risk factors on immunologic failure, only technically successful transplants were analyzed. Technical failures were primarily defined as early graft thrombosis or graft removal due to bleeding, anastomotic leaks, pancreatitis, or infections.

The impact on center volume was measured by defining low-volume, medium-volume, and high-volume centers. This was achieved by counting the number of transplants per center from 2001 to 2005 and defining the tertiles of these counts. A low-volume center performed a maximum of 14 and a high-volume center performed at least 40 transplants during a 5-year period.

A wide range of different antibody induction regimens were noted. For analyses, induction therapy was defined as the use of depleting (eg, rabbit antithymocyte globulin, alemtuzumab, anti-thymocyte globulin [equine]) and/or nondepleting (daclizumab, basiliximab) antibodies.

For maintenance therapy, a multitude of different drugs and combinations were recorded. The analyses focused on the most commonly used combinations of tacrolimus (Tac) in combination with mycophenolate mofetil (MMF) with or without steroids. Another category was protocols, which were based on sirolimus (Srl) in combination with other drugs. All the other possible combinations of monotherapy, duotherapy, or Cyclosporin A-based therapy (CsA), which represented only a very small percentage, were combined in a category called Other.