Pancreas and Pancreas-Kidney Transplantation
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Pancreas transplant recipients are usually under age 50. The majority of pancreas transplants are performed on diabetics, who are generally under the age of 60, with imminent kidney failure or who no longer respond to insulin therapy. Generally, patients have to be on insulin for at least 10 years before being considered for a pancreas transplant. Pancreas-Kidney transplants are generally done on diabetics with ESRD.

Eileen M. Demayo, RN, lead inpatient transplant coordinator at Northwestern Memorial Hospital in Chicago, IL presented the following information at United Resource Network's, A Course In Transplantation For Case Managers in Newport, RI October 2003.

Types of transplants:
*Simultaneous pancreas and kidney transplant, which is more common than pancreas alone (SPK).
*Pancreas after kidney transplant - has some increase rejection rate (PAK).
*Pancreas alone are done for labile diabetics whose disease is uncontrolled. It is more difficult to monitor for rejection, because there is no kidney to monitor for rejection. Biopsy of the pancreas is not recommended (Demayo, E., RN 2003).

Objective of transplantation is to restore normal glucose metabolism without the need for exogenous insulin, and stop the progression of secondary complications of diabetes. With perfect control of carbohydrate metabolism, the development or further progression of the secondary complications of diabetes will possibly be prevented. Pancreas transplant will help prevent kidneys from developing nephropathy (Demayo, E., RN 2003).

Absolute Contraindications to Transplant
*AIDS or HIV.
*Acute (not-treatable) or chronic infection.
*Severe coronary artery disease
*Severe carotid artery disease.
*Chronic active hepatitis.
*Morbid obesity.
*Active substance abuse.
*Significant history of noncompliance, which is the number one reason for graft failure (Demayo, E., RN 2003).

Relative Contraindications
*Patients age> 50 for SPK and PAK.
*Active peptic ulcer disease.
*Malignancy within the past 5 years.
*Psychological dysfunction.
*Lack of family or support system (Demayo, E., RN 2003).

**Evaluation:**
*Diagnostic Studies - ABO, HLA typing, CBC, Chemistry, LFT's, lipids, amylase, lipase, Serologies (CMV, HIV, Epstein bar); C-peptide, Glycosylates hemoglobin; Chest x-ray; Cardiac evaluation (EKG, Adenosine stress test, Angiogram (with angioplasty/CABG if indicated); Mammogram, ultrasound of Gallbladder.
*Psychosocial assessment.
*Financial assessment (Insurance coverage, pharmaceutical coverage, home health coverage.)
*Many patients go home with home health needs such as wound care and IV infusion.
*Medicare only covers immunosuppression medications for 3 years at 80%. Average cost of immunosuppression meds is $1,000/ month.
*Medications for secondary complication (Demayo, E., RN 2003).

**Waiting Time**
*Simultaneous Pancreas and Kidney cadaveric transplant one to two years. *Pancreas alone, two plus years (2002 Milliman USA).

**Complications:**
*Infection, which increase after requiring treatment of rejection episode.
*Cardiovascular - Increase risk for post operative MI.
*Dehydration/Electrolyte imbalance (This is a big problem for patients who have been on dialysis, because they are use to being restricted on fluid intake and it is hard to change habits.) Treatment - IV hydration, bicarbonate replacement, diuretics, hemodialysis.
*Delayed Graft Function - Early use of nephrotoxic immunosuppressants such as Cyclosporin and Prograf.
*Hematuria - from erosion of bladder mucosa and ulceration of the duodenal segment. Treatment - Cystoscopy and cauteryization of bleeding site. Conversion to enteric drainage.
*Intra-Abdominal Abscess - Anastomotic leak of enteric drained pancreas. Treatment - Broad spectrum antibiotics and surgical intervention.
*Gastro-Intestinal Bleeding - Anticoagulation, bleeding from the anastomosis. Treatment - blood transfusions, IV hydration, surgical intervention (Demayo, E, RN 2003).
As noted in the OPTN/SRTR Annual Report, the use of induction therapy has been shown to significantly improve pancreas graft survival rates in simultaneous pancreas-kidney (SPK) transplant. Furthermore, SPK transplant recipients who receive induction therapy benefit from a reduced incidence and severity of kidney rejection episodes. However, in recipients given anti T-cell depleting induction agents, there was also a statistically significantly higher rate of CMV viremia/syndrome, especially in the subgroup of recipients who received organs from CMV serologically positive donors. For solitary pancreas recipients (pancreas after kidney PAK and pancreas transplant alone PTA), the addition of induction therapy is associated with a clinically significant improvement in pancreas graft survival rates. In the PAK category, the 3-year actuarial pancreas graft survival with induction therapy is 74% versus 64% without. In the PTA category, the 1-year functional survival rate for recipients with induction therapy was 86% versus 74% without. Between 1993 and 2002, the use of rabbit antithymocyte globulin increased from 0% to 37%; the use of daclizumab increased from 0% to 16%; and the use of basiliximab increased from 0% to 25%. In PAK and PTA patients, the same trends are observed. In PAK no antibody induction was used in 1993, but in 2002 all but 28% of cases used antibody induction. Most of the antibody induction in 2002 was with rabbit antithymocyte globulin (51%), daclizumab (26%), and basiliximab (8%). Similarly, in PTA patients, antibody induction was used in all but 33% of patients in 2002; 58% received rabbit antithymocyte globulin, 34% received daclizumab, and 5% received basiliximab (2003 OPTN/SRTR Annual Report).

Although successful pancreas transplantation achieves euglycemia and complete insulin independence, this occurs at the expense of hyperinsulinemia and chronic immunosuppression (Stratta et al., 1995).

As noted in the 2003 OPTN/SRTR Annual Report the trends of maintenance immunosuppressant therapy in the first year after transplant are as follows:

**Calcineurin inhibitors:** The change in the use of calcineurin inhibitors has again been more marked in kidney-pancreas transplants. Cyclosporine use decreased from 99.8% to 16% between 1992 and 2001. In SPK recipients, tacrolimus use rose from 0.5% in 1992 to 89% in 2001. The findings in PAK and PTA patients were even more dramatic. In PAK patients, cyclosporine use decreased from 100% in 1992 to 15% in 2001; tacrolimus use increased from 0% to 93%. In PTA patients, cyclosporine use decreased from 89% to 8% between 1992 and 2001, and tacrolimus use increased from 11% in 1992 to 99% in 2001 (2003 OPTN/SRTR Annual Report).

**Antimetabolites and rapamycin:** Antimetabolite use decreased from 99% in 1992 to 79% in 2001 in kidney-pancreas transplants. There was a shift from azathioprine, which decreased from 99% to 2% during this time period, to mycophenolate mofetil, which went up from 0% to 78%. The latter number is a decrease from 1998, where 92% of SPK patients received mycophenolate
mofetil; it likely reflects the increasing use of rapamycin. In PAK and PTA patients, the same trends are present. There has been a steady increase in use of rapamycin in SPK patients, increasing from 0% to 27% between 1992 and 2001. This has been mirrored in PAK patients: rapamycin use has gone up from 0% to 29%. In PTA patients, rapamycin use has increased from 0% to 15%. The latter presents a decrease from 2000, where 25% of PTA patients received rapamycin (2003 OPTN/SRTR Annual Report).

Corticosteroids: Corticosteroid use in SPK patients decreased slightly from 100% in 1992 to 92% in 2001, reflecting an increased use of steroid-weaning protocols. Steroid use, however, has remained relatively stable in PAK patients and almost as high in PTA patients (2003 OPTN/SRTR Annual Report).

The OPTN/SRTR Annual Report 2003 noted that graft survival rate for Pancreas alone to be 77.3% at one year and 41.8% at 5 years. For pancreas after kidney the one-year survival rate was 79.4% at one year and 46.0% at 5 years. Kidney-pancreas (kidney) graft survival rate at one-year was 92.0% and 74.2% a 5 years. Kidney-pancreas (pancreas) graft survival rate was 85.1 % at one-year and 69.8% at 5 years (2003 OPTN/SRTR Annual Report).

The Milliman USA Research Report 2003 listed the cost of pancreas transplant and the first year following as follows: Evaluation - $9,500; Procurement - $43,900; Hospital - $40,200; Physician - $15,200; Follow-up $31,200; Immunosuppressants $8,900. The cost of Kidney Pancreas was noted as: Evaluation - $9,500; Procurement - $89,600; Hospital - $39,400; Physician $15,200; Follow-up - $31,200 and Immunosuppressants $10,600.

Eileen M. Demayo, RN, lead inpatient transplant coordinator at Northwestern Memorial Hospital in Chicago, IL. presented information regarding Islet Cell Transplants. Islet cell transplant is a new answer to pancreas transplant. Over 500 to 600 have been performed worldwide. The goal is to achieve glycemic control with minimal risks. Islet transplants are in Phase I research. Post-transplant the patient still requires immunosuppression without corticosteroids. Multiple transplants are needed, so multiple donors are required (Demayo, E., RN 2003).

Types of Islet Transplants:
* Islet transplant alone.
* Islet after kidney transplant.
* Simultaneous islet and kidney transplant.
* Auto islet transplantation done for pancreatitis and cancer (Demayo, E., RN 2003).

Ideal Islet Candidates
* Adults with type I diabetes (neg c-peptide).
* No liver or kidney disease.

**Complications:**
*Partial thrombosis of portal vein.
*Bleeding from catheter exit site.
*Immunosuppression complications.
*Abdominal pain.
*Elevation of LFTs (Demayo, E., RN 2003).

**Metabolic Monitoring**
*Daily fasting c-peptide and glucose for first week, then weekly.
*Ensure stimulation test at 2 weeks, 3 months, then every 6 months.
*IVGGT and OGTT at 1 and 3 months, then every 6 months (Demayo, E., RN 2003).

**Limitations**
*Islet isolation facilities are not available at most institutions.
*Methods required for isolation and purification are complicated and require a steep learning curve.
*State of art isolation facilities are expensive to develop.
*For insulin independence two cadaveric donors are required.
*Cost of islet transplant procedure and immunosuppression are high (Demayo, E, RN 2003).

**Works Cited:**


Stratta, RJ; Taylor, RJ; Larsen, IL; Cushing, K; “Pancreas transplantation;” Department of Surgery, University of Nebraska Medical Center, Omaha; Ren Fail (United States); July 1995; 17(4); P. 323-337.