Kidney (Renal) Transplantation
By: Kay R. Brown, CLCP

Kidney transplants are performed for treatment of End Stage Renal Disease (ESRD). The primary contributor to ESRD is diabetes mellitus, although there are certainly other causes such as malignancies, chronic reflux and injuries. End Stage Renal Disease can be treated with two basic methodologies, dialysis or transplant. There are varying types of dialysis options, depending on the particular needs of the patient. Hemodialysis is typically provided within a dialysis center, although there are some instances when it can be provided in the home setting. Continuous ambulatory peritoneal dialysis (CAPD) and continuous cycling peritoneal dialysis (CCPD) are performed in the home setting. Paul Eggers (1992) notes that dialysis is a costly therapy, but the cost tends to be stable over time. The alternative treatment option for ESRD is kidney transplant, which has a high initial cost followed by a much lower costs of maintaining a functioning graft (Eggers, 1992).

Shires et al. (1994) writes that the advent of successful hemodialysis in the early 1960s was a major stimulus to the development of kidney transplantation, both living-related and cadaveric, as an alternative to dialysis, with dialysis remaining a back-up treatment should graft failure occur. Additionally the development of new and better immunosuppressant drugs contributed to the success of transplantation. More kidney transplants are performed than any other type of solid organ transplant. The fact that living donors are capable of supplying the organs certainly contributes to this fact. Additionally, in November 1972 President Richard Nixon signed into law an amendment to the Social Security Act, which provided Medicare coverage for virtually all eligible ESRD patients (Shires et al., 1994).

Potential living donors, usually living-related donors, must be evaluated with numerous tests to determine if they are suitable candidates for donation of an organ. This is an important fact in that consideration must be given to the time commitment needed from a potential living-related donor. Although the OPO will cover the cost of all reasonable pre-transplant procedures, hospital charges, and post-operative care, they do not cover lost time from work.

The Lahey Clinic outlined the following information for pre-kidney transplant evaluation for the living donor. The living donor evaluation includes:
~ A complete history and physical (including routine cancer screening).
~ Blood work for blood chemistries, kidney and liver function, blood counts, blood work for infection exposure (syphilis, hepatitis B & C, AIDS, and other viruses), blood clotting studies, and urine examination.
~ 24-hour urine collection will be needed on two separate occasions to screen for kidney disease.
~ A preoperative chest x-ray.
~ EKG.
~ Ultrasound of the kidneys.
~ If there were a family history of diabetes, a 2-hour glucose tolerance test would be needed.

Other appointments scheduled for the potential donor:
- A transplant coordinator consult.
- Transplant surgeon appointment.
- Financial advisor appointment.
- Social services and/or behavioral medicine evaluation.

If all of the above testing is acceptable, then the potential donor will be scheduled for an abdominal CAT scan, which evaluates the kidney arteries. (Lahey Clinic 2003.) If all parameters were met for donor suitability, the surgery would then be scheduled. Living donor surgery as of the early 1990s has become less invasive. They can now do this laparoscopically, allowing for 24-hour hospital stay, quicker recovery, out of work for one week, less pain and less expense (Demayo, E., RN 2003).

There were 50,305 kidney transplant candidates on the UNOS waiting list as of November 2, 2001 (2002 Milliman USA). This number has surely increased since that time, and in spite of the fact that donor kidneys can in some cases be obtained from living-related donors, organs remain in short supply. The wait for a suitable organ varies, depending on the availability of a living-related donor and the severity of the potential recipients ESRD. ESRD, in most cases, can continue to be treated and the patient's life maintained with one of the forms of dialysis until a suitable organ becomes available.

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.

Indications for Transplantation
* Patients with end stage renal disease (ESRD).
* Patients with Type I diabetes.
* 18-65 years of age (Demayo, E., RN 2003).

Causes of ESRD:
* Glomerular diseases; Diabetes mellitus (30% of ESRD. Third leading cause of death.); Hypertension, Congenital disorders (polycystic kidney disease, Obstructive uropathy, Alport's syndrome).
* Retransplant.
* Vascular diseases.
* Tubular and interstitial diseases (Analgesic nephropathy, chemotherapy induced nephritis, radiation nephritis).
* Neoplasms (Demayo, E., RN 2003).
Wait on Transplant list
*5 - 6 year waiting for cadaveric donor
*Must be ABO compatible, HLA compatible, need tissue typing
*Living donor only has to be ABO compatible (Demayo, E., RN 2003).

Types of transplants:
*Kidney - Cadaveric (Data for 2000, shows that 60.6% of all kidney transplant recipients received kidneys from cadaveric donors. (2002 Milliman USA).

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 (number one reason for graft failure). (Demayo, E., RN 2003).

Relative Contraindications:
*Patients age> 65 for kidney.
*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 immuno-suppression medications for 3 years at 80%. Average cost of immunosuppression meds is $1,000 per month.
*Medications for secondary complications can cost $200 per month (Demayo, E., RN 2003).

Complications:
*Infection, which increase after requiring treatment of rejection episode.
*Cardiovascular - increase risk for post operative MI.
*Bladder Anastomotic Leak. Bladder anastomosis. Diagnosis - Ultrasound and analysis of fluids. Treatment - Percutaneous nephrostogram with stent placement and surgical repair.
*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 cauterization 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).

The OPTN/SRTR Annual Report 2003 stated that the period from 1993 to 2002 had seen a gradual shift toward routine use of antibody induction therapy, prior to kidney transplantation. The overwhelming majority of patients receiving antibody induction in 2002 received new agents that included rabbit antithymocyte globulin (ThymoglobulinB), which accounted for 25% of patients, basiliximab (SimulectB), which accounted for 25% and daclizumab (ZenapaxB), which accounted for 13% of patients. Basiliximab has become the most commonly used induction agent shortly after its approval by the FDA. This may be related to the smaller number of doses (two) associated with its approved use and the ability to give both doses during the initial hospitalization at the time of transplantation (2003 OPTN/SRTR Annual Report).

In order to ensure the survival of the allograft, kidney transplant recipients must be maintained on immunosuppression therapy for life. Kidney transplant recipients receive Calcineurin inhibitors, Antimetabolites and rapamycin and Corticosteroids (2003 OPTN/SRTR Annual Report).

Calcineurin inhibitors: In 1992, 96% of patients undergoing kidney transplantation received cyclosporine; only 2% received tacrolimus. The trend over the next 10 years has been a gradual decline in the use of cyclosporine. Tacrolimus use has increased steadily as cyclosporine use has decreased. In 2001, tacrolimus was used in 64% of kidney transplant recipients. The reasons for this conversion are
most likely related to multi-center trail data that have suggested lower rates of acute rejection and lower rates of steroid-resistant rejection associated with tacrolimus, also cosmetic issues such as the absence of hirsutism with tacrolimus (2003 OPTN/SRTR Annual Report).

**Antimetabolites and rapamycin:** In 1993, azathioprine was the only routinely available antimetabolite and it was used in 86% of kidney transplant recipients; by 2002, this had decreased to 2%. Mycophenolate mofetil, which was approved by the FDA in 1995, has seen its use increased to 79%. This percentage rate has remained relatively constant over the years. In all, 81% of kidney recipients received some sort of antimetabolite in 2002. The most popular combination regimen in recent years has included tacrolimus and mycophenolate mofetil, which has been utilized in the majority of patients under-going kidney transplantation (2003 OPTN/SRTR Annual Report).

**Corticosteroids:** Corticosteroids remain in use in virtually all patients undergoing kidney transplantation. The percentage has fallen very slightly from 99.5% in 1992 to 96% in 2001, suggesting that there is a small but growing percentage of patients who are no longer receiving corticosteroids (2003 OPTN/SRTR Annual Report).

The OPTN/SRTR Annual Report 2003 noted that graft survival rate for Living Donor kidney to be 94.3% at one year and 78.6% at 5 years. For cadaveric donor kidneys the one-year survival rate was 88.7% at one year and 65.7% at 5 years (2003 OPTN/SRTR Annual Report). The survival rate of living-related donor kidneys has increased from 12.7 to 21.9 years, and that for cadaveric grafts has increased from 7.9 years to 13.8 years. (Hariharan, S. et al.) Graft survival rate does depend significantly upon the recipient's compliance with treatment regimens. With each subsequent transplant the survival rate of the allograft reduces. Typically no more than three kidney transplants will occur over the course of a patient's life. When estimating the cost of kidney transplantation one must consider the cost of a return to dialysis in the event of graft failure, along with the cost of re-transplantation. A return to dialysis must be factored into the plan for a period before each transplant procedure. This should likely be a period equal to the average time for donor procurement.

The Milliman USA Research Report 2002, outlines estimated average 2002 first-year charges associated with kidney transplant to be as follows: Evaluation - $9,500; Procurement - $45,700; Hospital $32,800; Physician$13,500; Follow-up - $31,200; Immunosuppressants - $10,600.

Works Cited:
United Resource Network’s, A Course in Transplantation For Case Managers, Newport, Rhode Island, October 7-10, 2003.


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