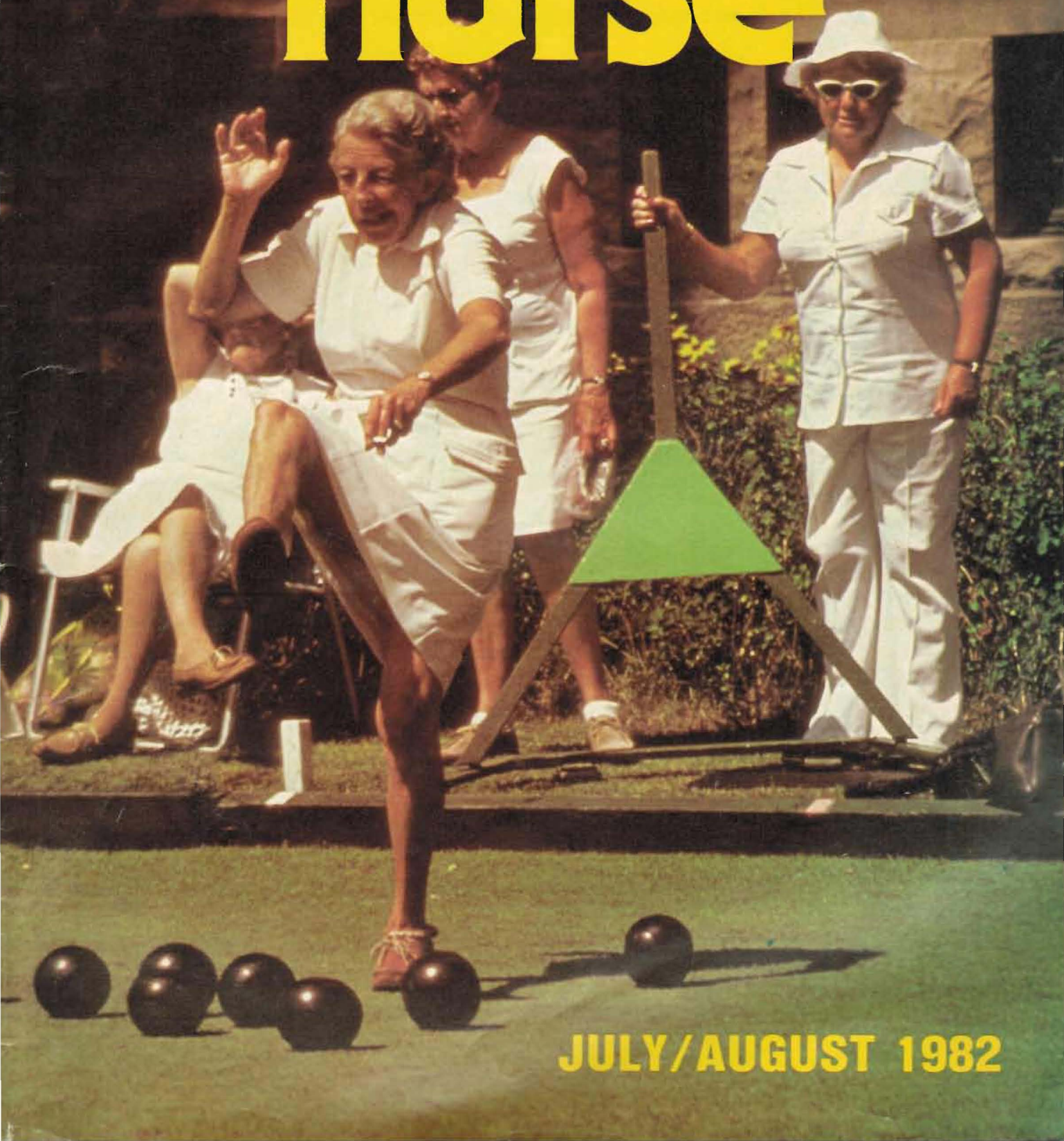
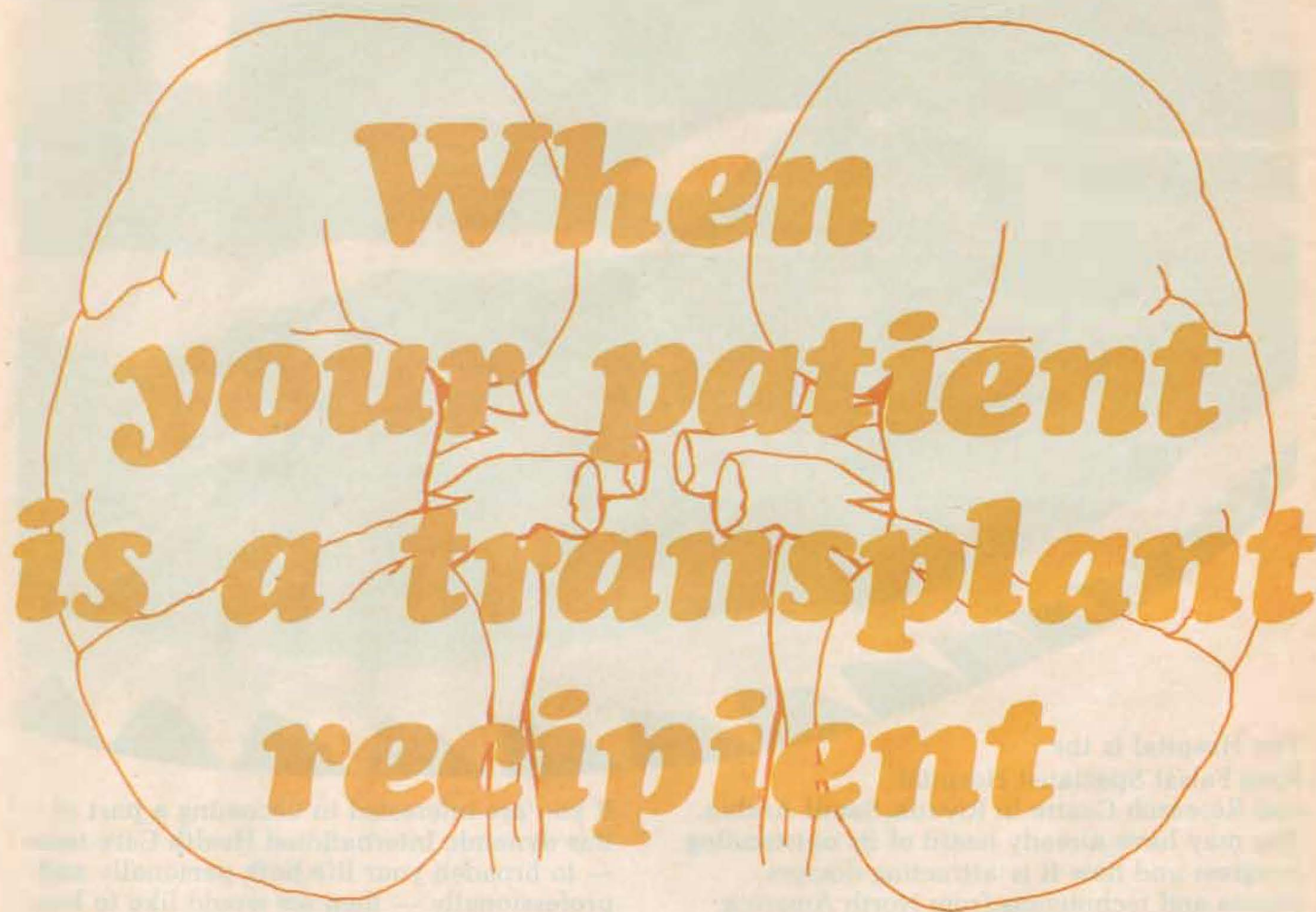


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Approximately 1,000,000 Canadians suffer from some type of renal disease, ranging from kidney stones to end-stage renal failure. While there are naturally many different forms of treatment depending on the condition, kidney transplantation is now considered a viable solution to end-stage renal failure when other methods of treatment are inadequate. Techniques have developed to the stage where kidney transplantation is considered a routine medical/surgical procedure. Newer and more efficient methods of tissue-typing, more effective immunosuppressant drugs and better understanding of the human immune system, now enable many individuals to resume a life that is closer to "normal" than that afforded by chronic dialysis.



When your patient is a transplant recipient

Patricia J. Houlihan

Who is a candidate?

The prospective kidney transplant recipient is an individual suffering from end-stage renal disease (ESRD) which can be caused by a number of prerenal, renal and postrenal problems:

- prerenal problems involve a decrease in the blood flow to the kidneys,

such as in the case of shock or severe burns;

- renal problems result from primary damage to the kidneys from chronic glomerulonephritis, diabetic neuropathy, hypertensive nephrosclerosis, congenital anomalies, etc., and

- postrenal problems include those which involve the urinary system distal to the kidneys such as urinary infections or obstructions.

Almost all individuals with ESRD can be considered possible candidates for transplantation except those with

metastatic cancer or severe chronic infections. Most though are in the 20- to 30-year age group. This factor coupled with previous long-term illness and/or hemodialysis, place significant psychological, emotional and social burdens on an individual at a time when most people are highly productive.

Patients with ESRD have three treatment alternatives: 1. transplantation, 2. chronic hemodialysis, or 3. long-term continuous ambulatory peritoneal dialysis. Each of the three has its own unique set of risk/benefits, which vary greatly from one individual to the next. A schema such as that described in Figure one is helpful in explaining the treatment process of ESRD as clearly and succinctly as possible, allowing the patient to think through the outcomes at each step along the way. The overwhelming advantages of the normal lifestyle offered by transplantation must be weighed against the risks and possible complications of surgery as well as the risks of immunosuppressant therapy. The chance of graft rejection and the possibility of second, third and fourth transplant attempts must also be discussed. With this kind of information, the patient along with his family can then decide if transplantation is the treatment of choice.

The renal donor

Kidneys for transplantation are obtained from two sources: cadavers and living-related donors.* Organ retrieval programs across Canada provide the potential recipient with the best possible tissue match with the least possible wastage of inappropriate organs. A number of programs have been initiated to increase the public's awareness of the need for kidneys and are expected to soon result in an increase in the number of available organs.

Kidneys for transplant can be preserved for only 36 to 60 hours by one of two available methods. Once removed from the donor the kidney is flushed with a cold Collins solution (an electrolyte solution for kidney preservation) and may be either placed in a sterile bag on cold "slush", or placed on a pulsatile perfusion machine while being constantly flushed with a Plasmatec® solution (five percent selected human plasma proteins, including albumin, alpha globulin and beta globulin). Kidneys preserved on pulsatile perfusion can be used until they are about 60 hours old, that is, about 25 to 30 hours longer than those preserved on slush.

The number of living, related donor transplants is beginning to increase at

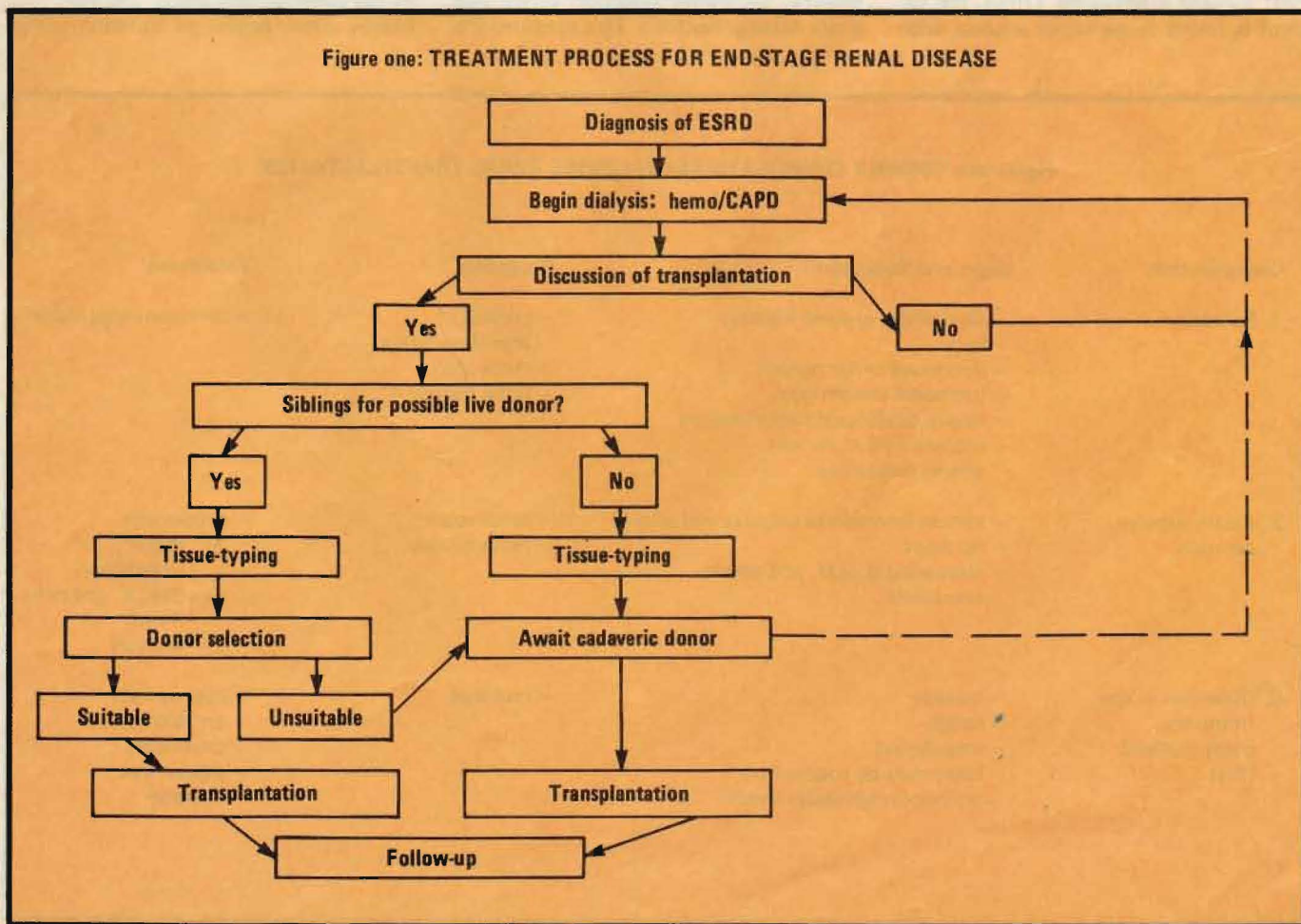
our center because of their enormous success rate: 85 to 90 percent three-year graft survival compared with 55 to 60 percent for cadaveric kidneys with conventional immunosuppression. Potential donors who are perfect tissue matches and have made the decision to donate are screened for: general health, renal function, renal vascular anatomy, cardiovascular status and psychiatric status, with particular reference to motivational factors and the individual's ability to deal with crisis. A living, related donor transplant is then scheduled as an elective procedure.

One very important preliminary step in patient and donor preparation for renal transplant is tissue-typing and matching. Three basic steps are involved:

- ABO blood grouping — the renal donor and recipient must share a compatible blood group,
- HLA typing (human leukocyte antigen) — involves the identification of the particular antigens located on a certain gene and comparing the donor and recipient for matching. This is referred to as the major histocompatibility complex.

*At our center, 80 percent of the 50 to 60 transplants carried out annually are from cadaveric donors.

Figure one: TREATMENT PROCESS FOR END-STAGE RENAL DISEASE



- cross-matching — using peripheral blood lymphocytes, donor and recipient specimens are "cross-matched" for identification of preformed antibodies.

Preparation for surgery

Whether a live donor or a cadaveric graft is involved, the in-hospital preparation of the patient is the same. The major difference is the time factor: the patient who is to receive a cadaveric graft must be prepared for surgery as quickly as possible. The nurse must bear in mind that the offer of a kidney and the decision to accept it are made in a split second and will have far-reaching effects on the future lifestyle of the patient and family, regardless of the outcome. The individual who is to receive a live donor transplant will have much more time to think about these decisions and will also face surgery with the knowledge that the chances for a successful graft are high.

Upon admission, blood is drawn for a complete blood count and white blood cell differential, clotting parameters, creatinine, blood urea nitrogen, glucose and electrolytes. A complete SMAC is recommended to provide a solid baseline for post-operative comparisons. At this time, a blood group and cross-match for four to six units of packed cells to be available during and post surgery is advisable. Often, the patient is found to be rather anemic, with

a hemoglobin hovering around the eight to 10 gram range. Transfusions are given for hemoglobin levels below six grams. If indices of kidney function are outside the normal ranges, especially an elevated potassium, the anesthetist will request that the patient be dialyzed to bring his blood values into an acceptable range and to remove any excess fluid.

A routine chest x-ray, a 12-lead electrocardiogram to assess cardiac status as well as a urinalysis and urine specimen for culture and sensitivity (if there is any urine output) are all necessary to provide a baseline for post-surgical assessment. A complete medical history and physical examination complete the assessment phase. Finally, the skin must be prepared by shaving from nipple line to visible pubic area and bed-line to bed-line.

Even when time is at a premium, the nurse must teach the patient as much as she can about the expected post-operative course. Careful explanation should be given about the probability of a urinary catheter, a hemovac, hourly observations such as vital signs, intake and output, central venous pressure monitoring as well as deep breathing and coughing, ambulation and immunosuppressive medications. Without alarming the patient, it is often wise to discuss the possible complications of surgery, including rejection crises and acute tubular necrosis. This prepares the

patient and his family for the possibility of a return to dialysis, even for a short time. The importance of avoiding any kind of infection must also be stressed so that the individual understands his role in the treatment course, eg. deep breathing and coughing to prevent pneumonia or any other preventable respiratory infection.

The surgery

The operative procedure may be explained rather simply as:

- exposure of the vessels,
- kidney placement,
- vascular anastomosis,
- ureteroneocystostomy (implantation of the donor ureter).

A 10- to 12-inch incision is made in either the right or left lower quadrant, depending upon whether the kidney itself came from the right or left side of the donor (it is placed contralaterally in the recipient). Generally, the graft is positioned extraperitoneally so that any manipulation of the gastrointestinal system is avoided, obviating the need for naso-gastric drainage in the immediate post-operative period. The iliac fossa provides a protected place for the kidney, as well as proximity to vascular access and free drainage through the ureter.¹ The most popular site for vascular anastomosis of the renal vessels is to the external iliac artery and vein. The kidney often begins to function imme-

Figure two: COMMON COMPLICATIONS FOLLOWING RENAL TRANSPLANTATION

Complication	Signs and Symptoms	Diagnosis	Treatment
1. Rejection	— tenderness around kidney — fever — decreased urine output — increased weight gain — newly developed hypertension — increasing B.U.N. and serum creatinine	— clinical manifestations — renal scan — renal biopsy	— immunosuppression
2. Acute tubular necrosis	— almost immediate oliguria and anuria — no fever — increasing B.U.N. and serum creatinine	— renal scan — renal biopsy	— supportive 1) dietary restriction (Na, K, protein, fluid) 2) dialysis
3. Infection in the Immuno-compromised Host	— malaise — cough — sore throat — fever may be masked by immunosuppressive meds	— cultures	— appropriate antibiotic coverage — supportive therapy

diately upon completion of the vascular anastomoses. At this time, urine can be seen spurting from the end of the as yet unconnected ureter. The donor ureter is then tunnelled into the bladder through the submucosal layer of the posterior wall.

Post-operative care

The three major priorities of nursing care of the transplant recipient in the immediate post-operative period are:

- maintenance of fluid balance and kidney function,
- observation and assessment for possible complications, and
- prevention of infection.

1. Maintenance of fluid balance and kidney function. Although the post-operative care of the renal transplant recipient is relatively straightforward, one-to-one nursing will be required for about the first 24 hours as many hours of nursing time must be devoted to fluid replacement.

Naturally, the first priority for the nurse is maintenance of kidney function. Typical medical orders will include: measure hourly urine output, replace fluids with intravenous Ringers Lactate® at a rate of 50 cc plus the previous hour's urine output per hour, check blood pressure, pulse and central venous pressure Q1H, obtain renal scan within 12 hours after surgery and give furosemeide 40 mg IV if output falls below 50 cc per hour.

In order to maintain function, the kidney must be well hydrated, without overloading the cardiovascular system and resulting in pulmonary edema and congestive heart failure. Therefore, careful recording of hourly intake and output is essential. Urine output may be as much as 800 to 1000 cc per hour. This post-transplant diuresis is not uncommon and is probably due to a defect in the absorptive function of the proximal tubules which is related to the duration of ischemia which the kidney has undergone. It will subside. Don't forget that if the patient's own kidneys have been retained, their usual urine output must be considered in the measurement of the hourly output.

A renal scan in the immediate post-operative period gives the physician a baseline for graft flow and function as well as an alert to early signs of possible rejection and/or acute tubular necrosis.

Hematuria is to be expected during the first week. This is due to the vascularity of the bladder which has been incised for the anastomosis. No procedure which will create undue pressure on the ureteral-bladder suture line should be carried out. This would include vigorous irrigation of the bladder catheter or allowing the patient's bladder to become distended. Since this is a

normal and expected occurrence and usually subsides after one week, the patient should be told pre-operatively to anticipate this.

2. Observation and assessment for possible complications. The most common complications following renal transplant are rejection, acute tubular necrosis and infection. Keen observation on the part of the nurse will aid in earlier recognition of these problems as well as prevent any serious setbacks (*See figure two*).

Rejection is the most common of the complications and may be seen in one or more of these three forms:

- hyperacute rejection — caused by preformed antibodies which were not detected in the pre-surgical cross-matching due to their small number, usually occurs at the time of vascular anastomosis on the operating room table and often necessitates immediate removal of the graft.

- acute rejection — usually occurs one week to four months after surgery² and most patients, particularly recipients of cadaveric grafts experience at least one episode. It is thought that the inflammatory response post-surgery causes vasculitis, which in turn decreases blood flow to the kidney, suppressing function and causing the BUN and serum creatinine to rise. An episode such as this is treated with immunosuppressive medications, the combination of which varies from one transplant center to another. Maintenance hemodialysis or peritoneal dialysis is sometimes required during the resolution of this rejection process. Repeated attacks of unresponsive acute rejection eventually result in graft failure.

- chronic rejection — occurs over a long period of time and by definition is irreversible.³ Degenerative changes in the kidney finally result in a total lack of function, but in this case the kidney need not be removed.

Acute tubular necrosis (ATN) which results from ischemia suffered by the kidney between the time of removal from the donor and implantation in the recipient, is a complication almost exclusive to cadaveric grafts and results in early non-function. Treatment for ATN is supportive and the patient must be dialyzed regularly until this phenomenon subsides. ATN and acute rejection may mimic one another.

Diagnosis of ATN may be made using clinical signs and symptoms coupled with a renal scan, however, definitive diagnosis requires renal biopsy and microscopic examination of the renal cortex. Renal biopsy is usually a bedside procedure carried out under

local anesthetic. Since the procedure itself carries certain risks of hemorrhage and damage of the graft it is vital that the patient understand the importance of the procedure and his role in it. He will lie supine, his skin will be cleansed, a local anesthetic applied and the biopsy needle inserted. To immobilize the kidney which moves with diaphragm, the patient must hold his breath during the procedure. Post-biopsy, pressure should be applied to the area for 10 minutes to prevent any extrarenal bleeding, vital signs and urine output checked Q 15 min x 4, then hourly and bedrest enforced for the next six to eight hours.

3. Prevention of infection. Because kidney transplant recipients have a very depressed immune response as a result of their immunosuppressive medication regime, they have been nursed on protective isolation for the first several post-operative days in the past. However, we find that this precaution is no longer necessary in our unit as meticulous attention is paid to hand-washing and cleaning, and these patients are separated from visitors, staff members and other patients with infections.

Observations for signs and symptoms of an infective process and daily evaluation of the white blood cell count

Centralized inpatient care for transplant recipients and donors

The Victoria General Hospital, the largest teaching hospital in the Maritime provinces, opened its new Transplant Unit on October 1, 1980. One of the largest transplant centers in Canada, the new center consists of a five-bed transplant unit attached to a 12-bed medical area.

The unit serves four basic functions:

- accepting recent transplant recipients from intensive care
- assessing prospective recipients
- admitting post-operative patients who are suffering from complications such as infection, rejection or post-transplant nephrectomy requiring dialytic support
- receiving living related donors for pre-operative evaluation.

Renal transplantation began at the VGH in 1969, when three transplants were performed. Since the opening of the new Transplant Unit, between 40 and 45 transplants are carried out annually.

are mandatory. A severe depression of the total white cell count, and particularly the neutrophils, will necessitate the implementation of protective isolation and the temporary discontinuance of cytotoxic drugs. While the immune response is purposefully lowered through the use of these medications to prevent rejection of the kidney, a balance must be maintained to allow the body to resist dangerous infections.

Respiratory complications and their concomitant infections are generally preventable. The patient should be out of bed within the first 24 hours and continue to ambulate progressively. Early removal of the central venous pressure line and bladder catheter 24 to 48 hours post-operatively makes this ambulation easier. Early removal of these lines also decreases the chance of infection and removal of the bladder catheter virtually eliminates bladder spasms. Deep breathing and coughing should be encouraged and assisted if necessary by a rebreathing device.

Dietary management of the patient during the post-operative period may be complicated by a delay in graft function. Ideally the patient will begin taking clear fluids within 24 hours of surgery, then progress rapidly to a full diet. However, if graft function is compromised, restrictions of varying degrees will be placed on his intake of protein, sodium, potassium and fluids, similar to those which the patient followed prior to transplantation. Whatever the graft function, strict intake and output must be charted and a daily weight recorded on the permanent record.

Immunosuppression

The long-term requirement of renal transplant recipients to be maintained on immunosuppressive medications is perhaps the most worrisome aspect of follow-up care. The purpose of this treatment is to alter the natural immune response of the body so that it does not recognize the kidney as foreign and thus reject it. There are a number of modes of immunosuppression: radiation, which is rarely used now; plasmapheresis, currently gaining in popularity; and medications, the most common component in most protocols.

Classic immunosuppressant therapy has consisted of azathioprine used in conjunction with steroids. The potentially dangerous side effects of these drugs make it important that the patient is on the lowest dose necessary for the survival of the graft. The most serious side effect of azathioprine is its effect on bone marrow suppression. In addition, because it is excreted by the kidney, patients who may develop relative renal insufficiency are subject to overdose.

Steroids have many side effects including: moon face, gastrointestinal disturbances including hemorrhage, increased fat deposition, fluid and electrolyte imbalance, decreased tissue healing ability and hyperglycemia. Because of these, it is essential that the patient be well aware of the implications of the drug, so that he may protect himself where possible from these side effects.

Other drugs including anti-human lymphocyte globulin and anti-thymocyte globulin are also used as part of immunosuppressive protocols. These drugs must be given parenterally and may cause anaphylaxis as well as increase susceptibility to infection. Therefore, their use is restricted to a controlled hospital setting.

A new drug is currently on trial in Canada and appears to have significant potential in the future course of immunosuppressive therapy for transplant patients. This drug, Cyclosporin A®, may have fewer side effects than the currently accepted modes of treatment. It is now being used in conjunction with lower dose steroids and should be available on the market after the completion of the current drug trial.

Throughout the entire period of hospitalization the patient and his family require a great deal of emotional support as well as teaching. Encourage independence by allowing your patient to assume responsibility for his care as he becomes able, i.e. medications, specimen collection and daily weight. Ensure that he understands his medications, not only when to take them but also what side effects are to be expected and which are to be reported. Advise him on activity limitations; walking is an excellent exercise but more strenuous activities should be avoided for several months. Recommend that he avoid crowds and areas where he might come into contact with infectious processes until he is on maintenance steroid therapy. Finally, encourage him not to smoke, drink alcohol, take aspirin or to become highly stressed; in combination with steroid therapy these may result in gastrointestinal bleeding.

Two years ago only 400 individuals in Canada received cadaveric kidney transplants. Today, close to 1500 patients are currently awaiting renal transplants for which there are no available organs. The situation has improved however since the passing of the Human Tissue Gifts Acts, a piece of legislation which validates a wallet sized legal document for those wishing to donate their kidneys or other organs after death.

The Kidney Foundation of Canada, from which the card is available upon request, believes that the donor card program will result in a brighter future for hundreds of Canadians suffering

from end-stage renal failure. Foundation activities across the country include a national organ retrieval program, a national fellowship program to pursue research, a Canadian Renal Failure Registry, a quarterly newsletter "Courier" directed to professionals and patients and a Patient Services Manual now being produced to outline resources available to patients across the country. The Foundation also provides a unique camping experience for 40 to 45 "kidney kids" from across Canada at a National Dialysis Camp. ♦

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For Further Reading

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