Management of Renal Transplant Patients in the Emergency Department

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Abstract

Solid organ transplant patients constitute a special population in the emergency departments (EDs). Increasing numbers of patients are reported in EDs for transplantation-related complications. Complications related to organ transplantation can be categorized into four groups: anatomical, infection, rejection, and drug toxicity. In patients presenting to the ED, all these categories should be considered in the differential diagnosis. However, the exact etiology, may not be known until admission to the hospital for further evaluation. Therefore, every complaint from a transplant patient should be carefully evaluated. In this study, we will review the principles for the management of patients with renal transplantation in the ED. *(JAEM 2015; 14: 83-7)*

Keywords: Renal failure, transplantation, emergency care

Introduction

Organ transplantation is one of the most significant achievements in medicine for treating patients with end-stage organ failure. As a result of its success, increasing numbers of patients are reported in the emergency departments (EDs) for transplantation-related complications. Solid organ transplant patients constitute a special population in the ED. In this study, we will review the principles for the management of patients with renal transplantation in the ED.

The transplanted kidney lacks the native nerve innervations of its donor, and it is connected to multiple organs with surgical anastomosis. As a result, pain is an unreliable indication of the underlying pathology. Furthermore, it is important to consider the anatomical association of the transplanted organ in order to understand leaks and blockages that can occur at the sites of anastomosis. Vague signs and symptoms may develop as a result of inflammation and immunological responses to infection and malignancy. Therefore, every complaint from a transplant patient should be carefully evaluated. When major complaints are present, knowledge of the initial physiological condition of the allograft can help to rule in or rule out possible organ failure. Even minor changes in allograft functioning can indicate organ failure. The duration of time since the organ transplantation should always be considered when evaluating the patient's condition (1-3).

Complications of Renal Transplantation

Organ transplantation-related complications can be categorized into four groups: anatomical, infection, rejection, and drug toxicity. In patients presenting to the ED, all these categories should be considered in the differential diagnosis. However, the exact etiology, may not be known until admission to the hospital for further evaluation (1, 2).

A. Complications Related to Transplantation Technique

Transplantation technique-related complications can develop during the preparation for transplantation and during the surgery. They can be divided into early- and late-stage complications (2).

1. Early-stage complications

Early-stage complications can develop immediately after the surgical procedure or during the early postoperative period. They include general complications, including abscess formation, bleeding, hematuria, incisional hernias, urinary fistulas, arterial thrombosis, and venous thrombosis (4-9).

The treatment of these complications includes abscess or hematoma drainage, the placement of ureteral stents, percutaneous nephrostomy, hernia repair, vesical catheterization and/or double-J stent placement, radiological or surgical thrombectomy, and, mostly transplantectomy (2).

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2. Late-stage complications

Late-stage complications are those most likely to be encountered in the ED.

i. Ureteral stenosis

Ureteral stenosis is the dilatation of the renal calyces and renal pelvis. It commonly presents with elevated creatinine levels. It is typically encountered between the first and tenth year following the transplantation. There are three major causes of ureteral stenosis: elevated vesical pressure or urinary retention in thickened ureteral walls, vesicorenal reflux, and vesicoureteral reflux, resulting from scar formation or poor surgical technique. The last is the cause of ureteral stenosis in 80% cases, and it develops within the first year following the transplantation.

The initial intervention in the management of ureteral stenosis is percutaneous drainage with the monitoring of renal function. The definitive treatment depends on the severity of the stenosis, location of the stenosis, and the developmental stage of the stenosis. Endoscopic transurethral or percutaneous interventions and surgery in unresponsive cases are among the treatment options (2, 10, 11).

ii. Reflux and acute pyelonephritis

Acute pyelonephritis has been less commonly observed than reflux. However, in the presence of reflux into the renal cavity, it has been reported that the presence of lower urinary tract infection increases the likelihood of developing acute pyelonephritis from 10% to 80% (12).

All reflux cases complicated by acute pyelonephritis should be treated with an endoscopic injection method. If unsuccessful, ureteroureteral anastomosis or ureterovesical reimplantation can be considered (2).

iii. Kidney stones

Kidney stones can be transplanted along with the donor kidney or they can develop following transplantation. Kidney stones present with hematuria, infection, or obstruction. A non-contrast tomography scan is usually required for diagnosis (13, 14).

Some kidney stones can be eliminated from the body through the urine, while others require interventional procedures. There are several alternatives, beginning with double-J catheterization and ultrasonography-assisted percutaneous nephrostomy. Based on the size and location of the stone, the other options include extracorporeal shock wave lithotripsy, percutaneous or open nephrolithotomy, or ureteroscopy (2).

iv. Renal artery stenosis

Clinicians should suspect renal artery stenosis when existing arterial hypertension becomes resistant to medical therapy and/or serum creatinine levels increase in the absence of hydronephrosis. Doppler sonography is a rapid and simple diagnostic method for this condition (15, 16).

There are different management options for renal artery stenosis. Conservative approaches include medical treatment and close monitoring of renal function. However, interventional options should be considered when stenosis exceeds 70% (2, 3).

v. Arteriovenous fistula and pseudoaneurysm following renal biopsy

Arteriovenous fistula should be considered in the case of ongoing hematuria. It is observed in approximately 10% (range 7%-17%) of renal biopsies and can be diagnosed with Doppler sonography. The diagnosis can be confirmed with magnetic resonance imaging (MRI) or angiography. Angiography is the first option in the management of this condition. Fistulas can be spontaneously reduced in size. However, selective embolization is recommended in cases of ongoing hematuria or fistulas with >15 mm radius (6).

vi. Lymphocele

A lymphocele can develop secondary to insufficient lymphostasis of the iliac arteries and/or transplanted kidney. They are typically asymptomatic, but they can present with pain resulting from the compression of the ureter or infection (17).

Mild cases of lymphoceles do not require any treatment unless there is compression of the iliac arteries or transplanted ureter. In these cases, interventions with laparoscopic or open surgical methods are recommended (2).

B. Immunosuppression-Related Complications

Immunosuppression is one of the cornerstone therapies in the management of transplantation patients. The underlying principle in successful immunosuppression therapy is the "survival balance." The drug regimen should be well-balanced so that the patient is not at a risk of immunological complications, while the risk of organ rejection is minimized. Immunosuppression is, particularly important in the early stages following transplantation when the incidence of post-transplantation rejection is the highest. In later stages of the post-transplantation period, graft adaptation occurs, and the incidence of rejection is greatly reduced. The rejection prophylaxis is phased out by reducing the doses of steroids and calcineurin inhibitors (18, 19).

The initial, standard immunosuppression therapy is well-tolerated and usually achieves successful maintenance of the transplanted kidney. This treatment is administered to the majority of patients and includes the following classes of drug (1-3):

a) Calcineurin inhibitors: cyclosporine and tacrolimus
b) Antimetabolites
   i. Mycophenolate (or enteric-coated m*ycophenolate* sodium)
   ii. Azathioprine
c) Steroids: prednisolone or methylprednisolone
d) With or without induction therapy

1. Specific, dose-dependent side effects

All immunosuppressant drugs have specific, dose-dependent side effects. Therefore, current immunosuppressive protocols recommend the use of synergistic regimens to reduce drug-specific side effects. With this approach, the dose for each immunosuppressive drug is reduced, thereby minimizing side effects, while the efficiency of treatment is achieved through the synergistic effects of the combined immunosuppressive drugs (20).

Some of the reported side effects of calcineurin inhibitors include nephrotoxicity, hypercholesterolemia, hypertension, hypertrophy of the oral mucosa, constipation, hirsutism, acne, diabetes, neurological and gastrointestinal side effects, and polyoma nephritis (1, 2).

The recognized effects of the antimetabolite drug class include bone marrow suppression, gastrointestinal side effects, and polyoma nephritis (1, 2).

Drugs in the steroid class have the following side effects: hypertension, hyperlipidemia, diabetes, osteoporosis, avascular necrosis of the femoral head, obesity, cushingoid appearance, skin thinning, capillary fragility, insomnia, and neurological tremor (21).

2. Non-specific side effects

Side effects, which are not specific to any particular class of immunosuppression therapy, include a high risk of malignancy and infections, particularly opportunistic infections (1-3).

i. Infections

The development of infection following transplantation is the primary cause of mortality in transplant patients. The signs of infection are usually vague in this patient population because of an impaired inflammatory response. Vague, minor complaints or development of fever in a previously afebrile patient may be the only indications of a severe infection. The aggressive management of infections is imperative for patient survival and preservation of the function of the graft (1-3).

Infections are categorized into three groups based on the stage of development. This classification is also useful for identifying the etiology and the underlying infectious agent.

a. First month following transplantation

The most likely causes of infections developing within the first month of transplantation include transplant procedures, catheters, and intubation. Typical causes of post-operative fever should also be considered with nosocomial pathogens firstly. The management of these patients is no different than any other immunosuppressed patient (22).

b. One–six months following transplantation

The infections developing between the first and sixth months are categorized into two groups: immunomodulator-related viral infections [*Cytomegalovirus* (CMV), hepatitis B and C, BK polyomavirus, human herpes virus 6, and Ebstein-Barr virus (EBV)] and opportunistic infections (pneumocystis, listeria, and fungal species).

Cytomegalovirus is the most common viral infection associated with immunomodulators during this period. It may trigger or worsen organ rejection. CMV is usually observed as a multisystem infection; however, pneumonitis is also a common form. CMV infection usually develops within the first 40 days following transplantation. Survival from this infection depends on early diagnosis with the aggressive use of bronchoscopy, and administration of ganciclovir and CMV-specific immunoglobulin agents (1, 23).

Infections caused by EBV present with similar clinical findings to CMV. The two viruses are often observed together. EBV can cause fever, malaise, lymphadenopathy, and a mononucleosis-like syndrome. Furthermore, EBV is associated with B-cell lymphoproliferative syndrome (24).

c. Six months and beyond after the transplantation

Patients with functional solid organ allografts who are receiving immunosuppressants six months following transplantation are classified into three groups based on sensitivity to infections.

The healthy transplant patient group includes those who have not developed chronic immunomodulator-related viral infections. There is a slightly elevated sensitivity to community-acquired infections in this group.

The second group includes those with progressive disease processes. This can be caused by a combination of immunomodulator-related infections and long-term immunosuppression therapy. Among those diseases are progressive liver disease (recurrent or acquired viral hepatitis), B-cell lymphoproliferative diseases (associated with EBV), primary varicella infection, reactivating latent VZV infection, and HSV reactivation.

The last group includes patients with chronic rejection. They are in constant need of aggressive immunosuppressive therapy in order to protect the graft. These patients are at a grave risk of life-threatening fungal and parasitic diseases. Fungal infections typically manifest with subacute respiratory complaints. Diseases, such as invasive candidiasis and aspergillosis, result in severe and life-threatening presentations. Furthermore, diverticulitis may occur and is primarily a bacterial gastrointestinal infection. Transplant patients are also at a greater risk of mucosal invasion by *Salmonella* and *Listeria*. *Nocardia asteroides* and subacute pulmonary infections can cause metastatic infections in the brain and skin. *Pneumocystis carinii* pneumonia is usually reported together with CMV, and it is clinically impossible to differentiate the two. *Strongyloides stercoralis* causes hemorrhagic enterocolitis and pneumonia. Mycobacterial diseases can be clinically silent, even when disseminated. Drugs typically used to treat these infections can cause chronic graft dysfunction (1, 22, 25, 26).

C. Immunological Complications

Immunological rejection is a common cause of transplant dysfunction in both the early and late stages. There is a significant variation between the onset and severity of the rejection episode and response to treatment (2).

Factors that determine the development of a rejection episode and response to treatment are as follows: degree of sensitization to human leukocyte antigens (HLA), level of HLA-mismatch (particularly in sensitized recipients), previous episodes of rejection, previous history of transplantation (particularly when graft loss occurred due to acute rejection), non-compliance with the immunosuppressant therapy, and viral infections such as CMV (27-31).

Immunological rejections are classified into three major groups (2):

1. Hyperacute rejections

Hyperacute rejections (HAR) are the most dramatic type of immunological response that causes the greatest amount of damage to grafts. The source of HAR is the complement-fixing IgG antibodies in the circulation that develop against donor antigens. HAR is less frequently encountered as the development of cross-match tests. It typically develops within the first minutes or hours following vascularization after transplantation. It can also be seen, although rarely, during the first week following transplantation. The presence of a delayed HAR rejection is recognized by acute anuria, fever, and swollen graft. The only treatment for HAR is nephrectomy (27-31).

2. Acute allograft rejection

Based on the results of a renal biopsy, acute allograft rejections are classified as T cell-mediated acute cellular rejection (ACR) and antibody-mediated acute humoral rejection (AHR). ACR is more common than AHR and is commonly observed during the first three months following transplantation. It responds well to bolus steroid treatment. Although seen infrequently, AHR has a poor prognosis (27-33).

3. Chronic allograft rejection

Chronic allograft rejection is a slow-developing immunological process that is infrequently observed. Histological findings reveal that it is manifested by interstitial fibrosis/tubular atrophy (IF/TA) and chronic progress. IF/TA takes from months to years to develop. Serum creatinine levels increase over several months, either simultaneously with, or after the development of, proteinuria and hypertension. The likelihood of development of IF/TA is high in patients who develop ACR in the early stages following the transplant. Therefore, it is critical to prevent the development of ACR (32-34).

The gold standard for distinguishing the types of rejection is the transplant biopsy. However, in most cases, mixed histological findings are detected. The Banff classification, which is used for diagnosis, is fundamental for determining prognosis and treatment options (34).

Nursing Care of Renal Transplant Patients in the ED

Nurses caring renal transplant patients must have expertise not only in nephrology but also in immunology and emergency (35-37). The management of medication, fluid balance, and other problems often surrounded by complications such as graft loss, failing renal transplant, and obstructive uropathy, pose serious challenges to renal nurses. The development of protocols and incorporation of nursing theories into the care process enhances nurse care for renal transplant patients (36, 38).

A. Nursing Diagnosis for Renal Transplantation

- High risk of infection related to altered immune system secondary to immunosuppressant medications,
- High risk of altered oral mucous membrane related to increased susceptibility to infection secondary to immunosuppression,
- High risk of self-concept disturbance related to transplant experience, potential for rejection, and side effects of medications,
- High risk of noncompliance related to the complexity of treatment regimen and euphoria,
- High risk of an ineffective management of therapeutic regimen related to insufficient knowledge of the prevention of infection, activity progression, dietary management, daily record keeping, pharmacological therapy, signs and symptoms of infection and rejection, effective birth control measures/pregnancy recommendations, follow-up care, and community resources.

B. Nursing Intervention for Renal Transplantation

- Physical, psychological and educational support to the patient and family members,
- Maintenance of fluid and electrolyte balance,
- Wound care, pain management, good pulmonary toilet with incentive spirometry,
- Monitor input output by urinary catheter every hourly (36).

Renal transplant patients who present to the ED require vigilance in four areas:

- Immediate resuscitation requirements,
- Renal specific issues,
- Immunocompromised context in terms of risk of infection and malignancy,
- Underlying pathology, which led to renal disease in the first place.

Emergency nurses frequently contact patients in the emergency department before the patient consults a physician. In this situation, the nurse must be skilled at rapid, accurate physical examination; early recognition of life-threatening illness or injury; the use of advanced monitoring and treatment equipment, and in some cases, the ordering of testing and medication according to "advance treatment guidelines" or "standing orders" set out by the hospital's emergency physician staff. Nurses would set up a database that outlines the observed number of patients, ordered diagnostic tests, referrals made to other emergency care professionals, and prescribed medications (36, 38).

Emergency nurses determine the severity of patient's condition based on symptoms and check vital signs, which include temperature, heart rate, and blood pressure. At the same time, provide psychological support, address concerns, and provide information as required for client, and family is very important in ED (38).

Conclusion

When dealing with the clinical findings of solid organ transplant patients, ED professionals should remember that the symptoms of allograft rejection are usually vague and nonspecific. Furthermore, signs and symptoms related to infectious complications vary with the source of infection, pathogenic organism, and level of immunosuppression. It is paramount to continue appropriate immunosuppression while managing transplantation-related complications.

Transplant patients require extensive laboratory and radiological evaluations in order to rule out an infectious etiology, evaluate the allograft function, and determine drug toxicity. Laboratory tests should focus not only on those that evaluate organ functioning but also those that investigate for infection. Radiological studies should focus on determining the source of infection and allograft anatomy. With an increased awareness regarding transplantation, ED professionals can offer accurate and effective management.

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