**Peritoneal Dialysis And Renal Transplantation**

Urmila Anandh

Department of Nephrology, Kokilaben Dhirubhai Ambani Hospital and Medical Research Institute, Mumbai

**Abstract:** Peritoneal dialysis is one of the integrated therapies for patients waiting for renal transplantation. Many studies show the occurrence of delayed graft function is lower in CAPD patients than in hemodialysis patients. Peritoneal dialysis modality plays an imperative role on their pre-transplant, perioperative and post transplant management of chronic kidney disease patients. Acute allograft rejection incidence is similar in peritoneal dialysis patients and hemodialysis patients.

**Key words:** Peritoneal dialysis, renal transplantation, hemodialysis, peritonitis

**Introduction**

With the increasing use of peritoneal dialysis (PD) as a modality of renal replacement, a significant ‘pool’ a patients on PD are now receiving a renal allograft or are in the waiting list for renal transplantation.

Recent data (USRDS 2000) suggest that 66.5% of incident PD patients in the year 1998 were less than 65 years of age. Combined with a better 2 year survival and an equivalent 5 years survival it is anticipated that this ‘pool’ of patients who will be receiving a renal transplant will increase in the years to come. In one centre in Europe retrospective analysis of their dialysis data show that a larger percentage of their PD patients received an allograft compared to their HD counterpart. These PD patients besides having the problems of end stage renal disease on dialysis have certain characteristics that are unique to them. These issues pertaining to their modality of dialysis often impact on the management of their peri-transplant period and its subsequent outcome.

**Pre-transplant Management**

Peritoneal dialysis patients awaiting a renal transplant are managed almost similarly to that of patients on hemodialysis (HD). However in certain areas, management differs and it is important that nephrologists managing these patients understand these situations and their management.

---

**Address for correspondence:**

Urmila Anandh

Department of Nephrology,

Kokilaben Dhirubhai Ambani Hospital

and Medical Research Institute, Mumbai

Email ID: uanandh@hotmail.com

---

**a) Cardiovascular co-morbidity**

Previously, PD patients often had worse cardiovascular function than HD patients. Infact, patients were often shifted from HD to PD because of the improvement in cardiac function. Since PD has been shown to decrease left ventricular (LV) volume and improve LV systolic function in patients with LV enlargement and systolic dysfunction. On the other hand PD is believed to adversely affect the lipid profile of these patients thereby potentially worsening atherogenic risk profiles. As far for all patients, a pre transplant work up complete cardiovascular evaluation needs to be done and corrective measures offered when indicated. Coronary artery bypass surgery can be performed safely & effectively in PD patients.

**b) Hypertension and fluid overload status**

Many studies have shown that systolic blood pressure control is better in PD patients than HD patients. However it is important to know that poor hypertension control is PD patients is positively correlated with volume overload, dialysate/plasma Creatinine and negatively with serum albumin. The close interlinking of hypertension, hypervolemia, transporter status and nutrition in PD patients warrants a through assessment and risk stratification pre transplant. Many nephrologists will prefer their patients to be mildly volume overloaded, if tolerated, as certain studies have shown that volume contraction that may be present post dialysis, may predispose to delayed graft function.

**c) Anemia, blood transfusion and presensitization:**

Even before recombinant erythropoietin was available, anemia was better controlled with PD for various reasons. PD patients maintained an average hematocrit of 29.4% compared to HD patients who had an average hematocrit of 24.3% (Table 1).
This better control of anemia leads to a lesser requirement of blood transfusion and consequently presensitization. This may be one of the reasons why PD patients have a shorter waiting period to transplantation.

d) Residual renal function

Peritoneal dialysis preserves residual renal function better because of its continuous nature in patients on CAPD and presumably because fluid shifts are less dramatic. Studies have shown that preservation of residual renal function not only improves survival but may also have a positive impact on immediate post transplant graft function. Hence all efforts should be made to preserve residual renal function in PD patients awaiting renal transplant.

c) Immune Status

Some studies have suggested that uremic patients, on peritoneal dialysis have a immune function. This may be responsible for the increase in acute rejection episodes that has been shown in some studies.

Table 1

Anemia in PD patients

<table>
<thead>
<tr>
<th>Improvement of anemia in PD patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Better clearance of middle molecules</td>
</tr>
<tr>
<td>2. Reduced hemolysis</td>
</tr>
<tr>
<td>3. Better preservation of residual renal function</td>
</tr>
<tr>
<td>4. More physiological biocompatibility of the technique</td>
</tr>
<tr>
<td>5. Low mechanical damage to red cells</td>
</tr>
<tr>
<td>6. Less blood loss, less iron requirement</td>
</tr>
</tbody>
</table>

f) Infections

PD patients who have an acute peritonitis episode should have their transplant deferred by 4-6 weeks after appropriate therapy of the infection. If the patient has an exit side infection the catheter is removed pre transplant at time of transplant. Peripancreatic abscess formation is an important cause of surgical morbidity in simultaneous pancreas kidney transplantation and has been found to be more common in PD patients. Optimally, current consensus is to preserve the catheter till the post transplant period in these patients. Optimally, patients undergoing a simultaneously pancreas kidney transplant should have a PD catheter placed in such a manner that the exit site is medial.

Perioperative Catheter Management

The abdomen is drained and the catheter is clamped pre transplant. If the kidney is very likely to function immediately post transplant, such as is the case if a living donor organ is used, many surgeons will remove the catheter during the transplant procedure. If there is a significant change of delayed graft function, the peritoneal catheter is maintained in situ during the transplant surgery. The catheter is clamped pre transplant and usually no routine flushing is undertaken post operatively. The only reason to flush the catheter is to study the effluent if the patient develops abdominal pain and pyrexia. Exit site care is as usual in the post transplant period. The catheter may be used post transplant if dialysis is required providing the kidney was implanted extraperitoneally with no rupture of the peritoneum.

Post Operative Management

The abdomen is drained and the catheter is clamped pre transplant. If the kidney is very likely to function immediately post transplant, such as is the case if a living donor organ is used, many surgeons will remove the catheter during the transplant procedure. If there is a significant change of delayed graft function the peritoneal catheter is maintained in situ during the transplant surgery and usually no routine flushing is undertaken post operatively. The only reason to flush the catheter is to study the effluent if the patient develops abdominal pain and pyrexia. Exit site care is as usual in the post transplant period.

a) Delayed Graft Function

Many papers have reported reduced incidence of delayed graft function in patients on PD. Cacciarelli et al. on a retrospective analysis, have shown a trend towards a decreased incidence of dialysis dependence in the early post transplant period in PD patients receiving deceased donor transplants. In another study immediate graft function was seen in 68.5% patients who were on PD pre transplant compared to 46.5% in those on HD. This beneficial effect of PD on immediate graft function has been replicated in various case control studies.

Analyzing the data from the United Network of Organ Sharing, Bleyer et al. compared the immediate post transplant outcome of all cadaveric graft recipients between April 1994 and December 1995. In their analysis the odds of oliguria in the first 24 hours were 1.49 (1.28-1.74) times higher in HD versus PD patients. The postulated reasons for the beneficial effect
of PD is in lower likelihood of volume contraction in PD patients pre transplant, though other studies have shown that the protective effect is independent of fluid status. Preservation of residual renal function in PD may also confer some protection. Difference in the immune function and cytokine production may also explain the difference in the behaviour of the ischaemic kidney. Despite earlier poorer results a recent study has shown that 5 year graft survival is similar in patients on both PD & HD.

b) Renal Vascular Thrombosis (RVT)

Retrospective studies have shown that renal vascular thrombosis post transplantation is more frequent in PD patients. This finding is consistent with an acquired thrombophilic state described in PD patients Table 2.

Table II

<table>
<thead>
<tr>
<th>Acquired thrombophilic state in PD patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Hemostatic abnormalities</td>
</tr>
<tr>
<td>Higher concentration of apolipoprotein(a)</td>
</tr>
<tr>
<td>Apo La (thrombogenic plasminogen-like moiety of lipoprotein(a))</td>
</tr>
<tr>
<td>Higher procoagulant activities of factor II, VII, VIII, IX, X, XI, XII</td>
</tr>
<tr>
<td>2. Drugs</td>
</tr>
<tr>
<td>No administration for of heparin as in HD during dialysis, release of tissue type plasminogen activator drug HD</td>
</tr>
<tr>
<td>3. Hemoconcentration</td>
</tr>
<tr>
<td>4. Hypoalbuminemia</td>
</tr>
<tr>
<td>5. Higher proportion of patients with cardiovascular morbidity (especially patients who have switched modality), poor blood vessels</td>
</tr>
<tr>
<td>6. Higher proportion of patients with diabetes mellitus – atherosclerotic blood vessels.</td>
</tr>
</tbody>
</table>

The risk is highest in patients who have switched from HD to PD before transplantation. Excess risk of RVT in patients who switched from HD to PD was probably due to the underlying clotted disorders in these patients which was initially responsible for the modality switch.

In contrast, PD was not an independent risk factor for RVT in an observational, retrospective cohort study by Perez Fontan et al. The incidence of RVT was similar in PD (4.7%) and HD (6.1%) patients. Logistic regression analysis demonstrated that protracted cold ischemia, delayed graft function, presenitization, extremes of age of the donor and use of the right kidney were the independent predictors of RVT in this study. A similar incidence of graft thrombosis in PD & HD patients has also been reported by Bakir et al. Even though there is some concern about the hypercoagulable state in PD studies have not been able to implicate it as an important factor for graft thrombosis.

c) Peritonitis and other infections

Infections post transplant are more common in patients who were on PD. The incidence of post transplant peritonitis has been reported to vary between 0-22%. Most of the infections are related to the peritoneal catheter and are caused by organisms that colonize the human skin. The treatment of peritonitis is similar to the ISPD recommendations. Rapid flushing is used if abdominal pain is severe and a very low threshold is maintained for catheter removal in these patients, especially if the transplanted kidney is functioning. Catheter infections in children are more common. 43% develop catheter infection within 2 weeks of discharge. In contrast, exit site infections are not common in the post transplant period with a reported incidence of (2.4%).

Peripancreatic abscess formation is more frequent in PD patients undergoing simultaneously pancreas kidney (SPK) transplant. The most common organism cultured is Staphylococcus epidermidis. In a large single centre study of SPK transplants, it was found that mortality was higher in patients who developed peripancreatic abscesses. However dialysis modality did not impact on the final patient & graft outcome.

Bacteremia in the first month post transplant was higher in HD patients. A positive blood culture was more likely in HD patients who have had an acute rejection. The mortality among these patients was more within 2 months of follow up.

Management of PD Catheter Post Transplantation

Peritoneal dialysis catheter can be maintained in the immediate post transplant period. Studies have shown that peritoneal dialysis can be performed effectively post transplant in cases of delayed graft function. Peritonitis rates are high; however infection control is often achieved with antibiotics. Some of the other complications observed are peritoneal leaks and post transplant ascites. Earlier studies used to advocate removal of the catheter 3 months post transplant if adequate renal function is established post transplant. Currently, centres recommend PD catheter removal at the time of transplant. In children PD catheters have been successfully used in delayed graft function. It is recommended that the catheter be removed at
the time of discharge in pediatric renal allograft recipients.  

**PD After Failed Renal Transplantation**

Many patients with allograft failure elect to receive PD as their modality of dialysis. Access problems often make PD a necessary option. Peritoneal membranes function well post transplant as has demonstrated in peritoneal equilibration test studies. No difference in survival in this cohort was noticed vis-à-vis patients with failed grafts who are on HD? These patients are younger and have a more rapid loss of residual renal function. Co-morbidity is the major determinant of survival.

**Conclusion**

Patients on peritoneal dialysis have similar post transplant survival as patients on hemodialysis. The peritoneal catheter can be kept & used if necessary in the peritransplant period. All centers which perform renal transplant surgery in PD patients should be aware of the specific issues particular to these patients.

**Reference**


41. Murphy BG, McNamee P, Duly E, Henry W, Archibold P, Trinick T. Increased serum apolipoprotein (a) in patients with chronic renal failure treated with continuous


