Timing for Removal of Peritoneal Dialysis Catheters in Pediatric Renal Transplant Patients

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Abstract

Objectives: Peritoneal dialysis, the preferred long-term renal replacement modality in the pediatric population, can also be used during the posttransplant period. Although it is well known that peritonitis or other complications may occur related to the peritoneal dialysis catheter, less is known about complications related to the peritoneal dialysis during the posttransplant period. Our objective was to evaluate the complications related to use of a peritoneal dialysis catheter during the posttransplant period and to determine the optimum time for removal of the peritoneal dialysis catheter.

Material and Methods: We retrospectively analyzed 33 chronic peritoneal dialysis patients. Pretransplant and posttransplant demographics and clinical and laboratory data for each patient were recorded, including incidence of peritonitis and incidence of peritoneal dialysis catheter requirement after transplant.

Results: Mean age of patients at transplant was 12.8 ± 4.0 years (range, 3.5-18.0 y). Mean catheter removal time was 81.1 ± 36.2 days (range, 22.0-152.0 d). The peritoneal dialysis catheter was used in 6 of 33 patients (18.2%); none of these patients developed peritonitis. In contrast, 2 of the 27 patients who did not use the peritoneal dialysis catheter developed peritonitis. Our data suggest that the need for catheter use occurs predominantly during the first month, and infectious complications usually happen later.

Conclusions: Previously, the trend was to not remove the peritoneal dialysis catheter at the time of transplant. However, in light of recent literature and our present study, we recommend that the time of catheter removal should be modified and decided for each patient on an individual basis.

Key words: Catheter removal time, Children, Peritonitis, Renal transplant

Introduction

Although renal transplant is the best renal replacement therapy in childhood, most children require a period of dialysis before renal transplant. Peritoneal dialysis (PD) is currently the most frequently used mode of renal replacement therapy.1–3 Infections following renal transplant are major causes of severe morbidity and mortality in children.4 One of the sources of infection in immunosuppressed renal transplant patients is the PD catheter, with occurrence of peritonitis also increasing morbidity and mortality. Although complications related to the catheter can be prevented by its removal, decisions on the best catheter removal time (CRT) are controversial. Our objective was to evaluate the complications related to use of a PD catheter during the posttransplant period and to determine the optimum time for removal of the PD catheter.

Materials and Methods

Our study included 33 chronic PD patients (19 male and 14 female patients) who received a renal transplant from 2000 to 2010 at Baskent University Hospital. Pretransplant and posttransplant demographics and clinical and laboratory data for each patient were recorded for the following parameters: sex, age at transplant, duration of pretransplant dialysis, the incidence of peritonitis after transplant, and the incidence of PD catheter requirement after transplant. All patients were treated under the supervision of a specialized PD team using standard PD systems and solutions.

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Standard immunosuppression included the use of a calcineurin inhibitor (cyclosporine or tacrolimus), methylprednisolone, and mycophenolate mofetil in all patients. Basiliximab was used as an induction therapy for some recipients. All patients received antimicrobial prophylaxis against *Pneumocystis jiroveci* and viral and fungal infections.

The PD catheter was left in situ during transplant unless exit-site or tunnel infection was present or suspected. The catheters were electively removed approximately at month 3 after transplant in those with stable graft function. Delayed graft function was defined as the need for immediate dialysis after transplant.

All documented complications were included within the medical records. Patients were diagnosed and treated for peritonitis if they had abdominal pain, blurred dialysate fluid, or both in association with a white blood cell count in the peritoneal fluid that was 100 cells/mL or greater. Peritoneal dialysis catheter exit-site infection was diagnosed when there was erythema and purulent or bloody drainage from the exit site; a positive culture result was not required. All episodes of peritonitis were recorded, including infections that tested negative in culture but were clinically treated as peritonitis. Post-transplant peritonitis was treated with appropriate antibiotics and early catheter removal in refractory cases without routine reduction in immunosuppression.

Statistical analysis was performed using SPSS version 18 software (SPSS Inc., Chicago, IL, USA) using the Windows operating system (Microsoft Corp., Redmond, WA, USA). All data are expressed as means ± standard deviation. Statistical significance was accepted at *P* < .05.

**Results**

Mean age of patients at transplant was 12.8 ± 4.0 years (range, 3.5-18.0 y). Mean CRT was 81.1 ± 36.2 days (range, 22.0-152.0 d). Mean duration of pretransplant dialysis was 28.5 ± 26.2 months (minimum to maximum of 2.0-120.0 mo). Of 33 patients, 27 (81.8%) had immediate graft function following transplant and did not require dialysis during the posttransplant period. A PD catheter was used in 6 of 33 transplant patients (18.2%), with 2 patients because of acute tubular necrosis, 1 patient because of acute graft lost, and 3 patients because of posttransplant ascites, during the first 15 days after transplant.

Although none of the patients who used the PD catheter after transplant had infections related to PD catheters, 2 of 27 patients (2/33; 6% of total patients) who did not use the PD catheter after transplant developed infectious episodes related to PD catheters. One developed peritonitis, and the other had exit-site infection at 2 and 3 months after transplant (Figure 1). These 2 infectious episodes were treated with appropriate antibiotics; there was no need for PD catheter removal due to the infections. In 8 of 33 patients, catheter removal was delayed beyond 3 months due to parental refusal of surgery. None of our patients had their catheters removed at the time of transplant. Immunosuppression was not reduced, and no graft losses were attributed to the episode of peritonitis.

**Discussion**

The timing of PD catheter removal after renal transplant is controversial. Presently, there has been no consensus regarding the optimal timing for PD catheter removal. In previous years, there was a trend to not remove the PD catheter at the time of transplant. However, recent literature has recommended that decisions concerning removal of a PD catheter must be made according to the patient’s condition. Arbeiter and colleagues stated that the removal of a catheter should involve the classic cost-benefit analyses. The “cost” of removal is the requirement for catheter reinsertion if a catheter is
subsequently needed. The “benefit” is the elimination of the risk of a catheter-related infection. The potential benefits of removing the PD catheter at the time of surgery is the elimination of a second procedure, as well as to avoid the potential complications due to having a PD catheter (including infection, peritonitis, and fluid leakage from the incision).\textsuperscript{6-10} Conversely, in case of delayed graft function, having a PD catheter in place postoperatively provides multiple benefits of use of the catheter, allowing the allograft to recover function. In addition, the presence of a catheter posttransplant, although not absolutely necessary in some patients, may allow better control of volume and electrolyte problems.\textsuperscript{7,11}

In previous pediatric studies, the most frequent catheter use occurred in the first month after transplant.\textsuperscript{8,12} Arbeiter and associates, in a study of 26 PD patients who had their PD catheters left in situ after renal transplant, showed that 12 patients (46\%) required its use because of delayed graft function within the first month after transplant.\textsuperscript{8} Six of these patients (50\%) had catheter-related peritonitis. Overall peritonitis rate in the study of Arbeiter and associates was 23\%. Similarly, Palmer and associates demonstrated that 43\% of allograft recipients who had PD catheters left in situ developed catheter-related infections within the first 3 months after transplant.\textsuperscript{12} Interestingly, in contrast to Arbeiter and associates, the PD catheter was not used in any of these patients.\textsuperscript{8,12} Gokal and associates and Bakir and associates also reported that there is a high risk with catheter removal because of nonresolving peritonitis or exit-site infections, even in patients who did not utilize the PD catheter, as shown in adults after renal transplant.\textsuperscript{6,10,13} In our study, PD catheters were used in 6 patients (6/33; 18.2\%), but none of these patients developed peritonitis. In contrast, in 2 patients (2/33; 6\%) who developed peritonitis, the PD catheter was not used, as also shown in the study of Palmer and associates.\textsuperscript{12} These studies and ours state that leaving PD catheters in place after renal transplant has a risk of PD catheter-related complications, even in cases where the catheter is not utilized. This information was confirmed by Warren and associates, who reported that leaving a PD catheter in situ at the time of transplant has a > 50\% chance of catheter-related complications if it is utilized and almost 7\% if it is not.\textsuperscript{6}

Catheter removal at the time of transplant also avoids the need for this procedure later,\textsuperscript{8} and removal of the catheter at transplant has been recommended to reduce the risk of continuous ambulatory peritoneal dialysis-related sepsis.\textsuperscript{14} Based on these data, Warren and associates have modified their institutional policy, and they now consider removing PD catheters at the time of renal transplant. They reported that if there is need for dialysis, as in case of delayed graft function, the patient can be treated with temporary hemodialysis, as these patients had no line-related complications.\textsuperscript{6}

In contrast to these studies, Andreetta and associates reported an extremely low incidence of posttransplant infection (1\% of 80 PD patients),\textsuperscript{6} thus arguing for a more conservative policy of catheter removal. Although many institutions leave PD catheters in situ at the time of renal transplant as recommended by the current guidelines for PD catheter management according to the European Best Practice Guidelines for PD, there is accumulating evidence that there is a high rate of PD catheter-related complications when the catheters are left in situ.\textsuperscript{5,15} We have shown that the PD catheter is usually needed during the first 2 weeks after transplant and that infectious complications occurred 1 month after transplant.

Based on our findings and previous reports, we conclude that the PD catheter can be removed after the first 2 weeks of transplant and should not be in place more than 2 months. However, although there were no complications in 6 patients using PD catheter, complications can develop, as shown in 2 patients who developed infection but did not use the PD catheter. These findings suggest that decisions concerning the PD catheter removal time must be given according to the patient’s clinical course. Obviously, every patient may have a different clinical course.

The most important point with regard to a decision is the probability of the patient requiring dialysis after transplant.\textsuperscript{6} McGregor and associates reported that most transplant recipients already have a central line at the time of surgery for central venous pressure monitoring and drug administration, as in our center; therefore, this line can be used as a dialysis line.\textsuperscript{7} In addition, the removal of the catheter at the time of renal transplant prevents complications that can be related to the PD catheter and eliminates the need for a second procedure.\textsuperscript{6,10,13}

In conclusion, we suggest that, when deciding catheter removal time, the clinical course of the
patient should be taken into consideration. For example, if a patient has little to no risk of developing a delayed graft function, the PD catheter can be removed at the time of transplant. In contrast, if a patient is at a moderate or high risk of developing delayed graft function, the PD catheter can be left in place.

The small number of patients and retrospective analysis are the limitations of our study.

References