Peritoneal Dialysis Immediately After Kidney Transplantation

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Approximately 10% – 20% of adult kidney transplant recipients and as many as 40% of pediatric recipients receive peritoneal dialysis (PD) before kidney transplantation. An important aspect of perioperative kidney transplant care is management of the PD catheter. Peritoneal dialysis can be performed immediately after transplantation for delayed graft function (DGF), which can occur with as many as 20% of deceased-donor kidney grafts, especially when expanded criteria or organs from donation after cardiac death are used. However, leaving the PD catheter in place has been associated with an increased risk for infections such as peritonitis and exit-site infection, even when the catheter is not used. Although no consensus has been reached about the management of PD catheters after kidney transplantation, transplant centers should have a low threshold for PD catheter removal at the time of surgery, especially in recipients with a low risk for DGF. In individuals with high risk for DGF, the PD catheter can be left in place, but it must be removed in a timely manner once it is no longer needed.

Key words
Kidney transplantation, peritoneal dialysis catheter, catheter removal

Introduction
It has been well established that, compared with dialysis, kidney transplantation offers survival benefits (1). Before kidney transplantation, as many as 20% of adults and more than 40% of children are receiving peritoneal dialysis (PD) (2–4). Management of the PD catheter is an important aspect of the perioperative care of kidney transplant recipients receiving PD.

Discussion
Management of the PD catheter at the time of transplantation
Currently, no clear consensus has emerged about whether the PD catheter should be removed or left in situ in case dialysis is needed after kidney transplantation. The medical literature is lacking in prospective randomized trials about the optimal management of PD catheters after kidney transplantation. The European Best Practice Guidelines are the only guidelines that address the issue. Those guidelines propose that “the catheter can be left in situ 3 – 4 months despite a functioning graft; nevertheless, earlier removal after successful transplantation is advisable (evidence level B)” (5). These opinion-based rather than evidence-based guidelines leave the practicing physician with uncertainty about the optimal management of the PD catheter after kidney transplantation, and therefore many transplant centers have developed their own policies. Understanding the risks of a retained PD catheter based on how likely it is that the catheter might be used after transplantation could facilitate decision-making on this important aspect of the post-transplant care of kidney graft recipients on PD.

Infectious complications related to the retained PD catheter
Infectious complications after transplantation related to a retained PD catheter remain a significant concern. Palmer et al. (6) reviewed 43 transplantation procedures performed on 35 children who had been receiving PD before transplantation. Peritoneal dialysis was performed in as many as 58% of the recipients within the first month after transplantation, either because of acute rejection or primary nonfunction of the kidney allograft, and 31 recipients were discharged from hospital with a functioning renal allograft and a PD catheter in situ. Of those 31 recipients, 13 (42%) developed a catheter-related infection—including 10
exit-site or tunnel infections, and 3 wall abscesses—even though the PD catheter was not used. Risks factors included a history of infectious complications before transplantation and treatment of acute rejection with steroids. This analysis prompted the authors to revise their center policy to remove the PD catheter at the time of discharge, especially when it is not needed.

Bakir et al. (7) evaluated in detail the risks of post-transplant peritonitis and its causative organisms. In that series, the incidence of post-transplant peritonitis reached 13%. Roughly one third of the episodes occurred within 3 weeks after transplantation, when PD was resumed because of allograft failure. Gram-negative organisms were cultured in 40% of affected recipients, followed by Staphylococcus aureus (33%) and S. epidermidis (20%); 7% of the episodes were polymicrobial. Risks factors for peritonitis included pre- and peri-transplantation characteristics such as male sex; previous history of peritonitis and exit-site infection; technical surgical problems during transplantation, including accidental visceral injury or peritoneal opening; a higher number of rejections (>2); and permanent graft nonfunction. In contrast, Andreetta et al. reported a relatively low risk of peritonitis after transplantation (8).

The most recently published report in the Canadian Urological Association Journal about the risks of a retained PD catheter is a welcome addition to the medical literature, given that it reflects more current immunosuppressive strategies and post-transplantation care (9). The authors retrospectively reviewed 137 kidney transplant recipients previously on PD who were transplanted in Canada and the United Kingdom between 2005 and 2008. In 19 patients, the PD catheter was removed; it was retained in 118 recipients. Among patients with a PD catheter in situ, 103 experienced immediate graft function and 15 required dialysis after transplantation. Complications related to the PD catheter reached more than 50% in those who required dialysis [peritonitis in 33%, and conversion to hemodialysis (HD) because of dialysate fluid leak from the surgical incision in 20%]. Recipients with immediate graft function whose PD catheter was not used also experienced infectious complications, albeit at lower rates (6.8% overall: 4.2% peritonitis, 1.9% catheter exit-site infection, and 1% emergency laparotomy for presumed peritonitis 2 months after transplantation). Based on their findings, the authors recommended a low threshold for early PD catheter removal.

Long-term outcomes of recipients receiving PD immediately after transplantation
The high complication rates in kidney graft recipients requiring PD immediately after transplantation raise an important concern about whether long-term patient and allograft outcomes could be affected.

Thomson et al. (10) retrospectively studied outcomes in 77 kidney transplant recipients who experienced delayed graft function (DGF), including 14 who had been receiving PD and 63 who had been receiving HD. The groups were comparable in terms of recipient demographics and urine volume before transplantation, but in those receiving PD, the percentage of grafts received from donation after cardiac death was higher, although the difference did not reach statistical significance (64% and 34.9% for recipients on PD and HD respectively, p = 0.69). Postoperatively, recipients on PD had composite rates of wound infection and leakage that were higher by a factor of almost 4; however, time spent on dialysis and length of hospitalization were shorter, likely because of the higher incidence of acute tubular necrosis in kidney transplant biopsies from recipients on HD. Long-term outcomes, including kidney function at 1, 6, and 12 months; hospitalizations; and graft and patient survival were comparable between the groups.

In another retrospective analysis, the dialysis modality used immediately after transplantation was similarly shown not to have significant long-term effects. Marek et al. focused on time spent on dialysis (11). They analyzed 83 recipients with DGF, finding that 53 patients required dialysis for less than a week; 13, for between 1 and 2 weeks; and 18, for more than 2 weeks. The distribution of HD and PD recipients was equal in all 3 groups. Results showed that longer time on dialysis and kidney donation after cardiac death, but not dialysis modality, were predictive of lower creatinine clearance at 1 year after transplantation.

Probability of need for dialysis after transplantation
The incidence of DGF—currently defined as a need for dialysis within the first week after transplantation—is increasing over time and currently exceeds 20% (12). It occurs predominantly in grafts coming from deceased donors because of ischemic injury before and after organ procurement and reperfusion injury after anastomosis. Organ shortage has led to more frequent use of expanded criteria and kidneys retrieved from donors after cardiac death, which are
associated with an increased risk of DGF. Moreover, certain pre-transplant recipient characteristics, including male sex, black race, obesity, diabetes mellitus, prior allosensitization, and prolonged waiting time, were shown to be important predictors of DGF (13). Many of those factors were incorporated in a nomogram developed by Irish et al. (available as an interactive calculator at http://www.transplantcalculator.com/Transplant-Calculators/Delayed-Graft-Function.aspx) that can be used to predict the probability of DGF (14). Predicting DGF at the time of transplantation can help to facilitate the decision to remove or not to remove the catheter at the time of the transplant surgery.

Interestingly, a growing body of literature reports a lesser risk of DGF in patients receiving PD before kidney transplantation (15,16), but that finding has not been consistent (2,17).

Primary graft nonfunction is not very common; it occurred in only 2.9% of all procedures in one series (18). The main cause of primary nonfunction was venous or arterial graft thrombosis, followed by poor organ quality and hyperacute rejection (just 1 case).

Summary
In the immediate post-transplantation period, PD is generally feasible. In patients who have a low risk for DGF, the PD catheter should ideally be removed at the time of transplantation. In recipients with a high risk of DGF, the PD catheter can be left in place, with a low threshold for its immediate removal once the allograft is functioning or any complication related to catheter retention occurs. Importantly, long-term outcomes in kidney graft recipients who require PD immediately after transplantation are not affected. Prospective trials should seek to identify the recipients who will be best served by leaving the PD catheter in situ, based on DGF risk stratification. Moreover, the risk for post-transplantation peritonitis based on pre-transplantation PD-related infections should be incorporated into decision-making.

Disclosures
The authors have no disclosures to report.

References


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