Peritoneal Dialysis Use in Patients With Ascites: A Review
Nilum Rajora, Lucia De Gregorio, and Ramesh Saxena

The past few decades have seen a steady increase in the prevalence of kidney failure needing kidney replacement therapy. Concomitantly, there has been a progressive growth of heart failure and chronic liver disease, and many such patients develop ascites. Therefore, it is not uncommon to encounter patients with kidney failure who concurrently have ascites. The presence of ascites adds many challenges in the management of kidney failure. Poor hemodynamics make volume management difficult. The presence of coagulopathy, malnutrition, and encephalopathy compounds the complexity of the management. Such patients do not tolerate hemodialysis well. However, several concerns have limited the use of peritoneal dialysis (PD), so hemodialysis remains the predominant dialysis modality in these patients. However, observational studies have illustrated that PD provides hemodynamic stability and facilitates better volume management compared with hemodialysis. Moreover, PD obviates the need for therapeutic paracentesis by facilitating continuous drainage of ascites. PD potentially reduces hemorrhagic complications by avoiding routine anticoagulation use. Moreover, small studies have suggested that outcomes such as peritonitis and mechanical complications are comparable to those in PD patients without ascites. PD does not affect transplant candidacy, and these patients can successfully receive combined liver and kidney transplants. Hence, PD should be considered a viable dialysis option in kidney failure patients with ascites.

Clinical Vignette
A 65-year-old man has a history of hypertension, type 2 diabetes mellitus, hepatitis C–related cirrhosis with ascites, and progressive chronic kidney disease (CKD) due diabetic nephropathy. In the past 3 months, he was hospitalized twice with episodes of spontaneous bacterial peritonitis and hepatic encephalopathy. Lately he had required frequent large volume paracentesis (LVP). His MELD (Model for End-stage Liver Disease) score was 21. His CKD had progressed to stage 5, and he had been educated about kidney replacement therapy options. He expressed a preference for peritoneal dialysis (PD), and voiced interest in kidney-liver transplant. He was referred to surgery for placement of a PD catheter, but was informed that patients with ascites should not get a PD catheter placed. Consequently, he was initiated on in-center hemodialysis (HD). He did not tolerate ultrafiltration due to persistent hypotension and remained volume overloaded. He still needed frequent LVP to manage his ascites. Should this patient be reconsidered for PD?

Introduction
Poor lifestyle behaviors such as smoking, unhealthy diet, inadequate physical activity, and excessive alcohol use have led to an upsurge in chronic diseases like diabetes, hypertension, metabolic syndrome, and obesity in the past few decades. Consequently, there has been a steady increase in the prevalence of kidney failure (KF). In parallel, there has been persistent growth of heart failure and chronic liver disease (CLD), particularly nonalcoholic fatty liver disease, as they share the aforesaid risk factors. Many patients with CLD and advanced heart failure develop ascites during the course of their disease. Therefore, it is not surprising to encounter patients with KF who concurrently have ascites.

The presence of ascites presents numerous challenges in the overall management of KF. These patients usually have poor hemodynamics, which makes volume management very difficult. Furthermore, the presence of coagulopathy, malnutrition, and encephalopathy compounds the management complexity. Such patients do not tolerate HD well. PD, by offering steady-state treatment, may provide hemodynamic stability and better volume management. Furthermore, PD eliminates the need for LVP due to regular drainage of ascites fluid. However, there is a perception that use of PD is associated with higher risk of infections, excessive albumin loss, and overall poor outcomes, and therefore should not be offered in patients with KF and ascites. In this review, we will discuss the challenges, outcomes, and technical aspects of performing PD in patients with KF and ascites.
Kidney Failure and Ascites

Epidemiology and Outcomes

Most early reports of ascites in KF patients described nephrogenic ascites in HD patients, with variable incidence rates (0.7%-20%) and poor survival (7.0-10.7 months).24,25 In contemporary times, nephrogenic ascites in KF patients is mainly observed in severely underdialyzed or malnourished HD patients,26-28 and will not be discussed in this review. The prevalence of ascites in KF due to cirrhosis and other causes remains uncertain. Small studies from Asia have observed a 4% to 6% incidence of cirrhosis in KF, but the incidence of ascites has not been reported in all studies.28-31 In one study of 1,069 adult KF patients from South Korea, 4.1% had cirrhosis, and 1.1% had ascites.28 The presence of cirrhosis increases the overall mortality risk in KF patients. In a Taiwanese national cohort, cirrhosis was found to be an independent predictor of mortality in dialysis patients.29 Likewise, in the Korean study, the cirrhotic patients had a significantly lower 1-, 3-, and 5-year survival compared with non-cirrhotic KF patients.28

Kidney Replacement Therapy in Patients With KF and Ascites

The presence of ascites in KF patients poses many challenges that make dialysis treatment arduous. Patients with ascites are overall hypervolemic, but they have low effective arterial blood volume. Rapid removal of fluid from the intravascular compartment during HD may thus produce severe hypovolemia and hypotension.13-15 This may preclude adequate ultrafiltration and result in insufficient fluid removal, progressive volume overload, and worsening ascites. Furthermore, hemodynamic instability may necessitate early termination of HD, thereby compromising adequate solute clearance and predisposing uremic state. Such a uremic state along with rapid osmotic shifts during HD treatment can alter cerebral water content and predispose patients to encephalopathy.16,17

Moreover, patients with cirrhosis frequently have multiple abnormalities of hemostatic function that may increase the risk of bleeding as well as thrombosis.12-14 Coexisting uremia may further exacerbate platelet dysfunction and increase the risk of bleeding complications. Use of anticoagulation in HD can aggravate the risks of gastrointestinal hemorrhage and excessive bleeding at the cannulation site.

Despite these challenges, HD remains the predominant dialysis modality among KF patients with ascites and the use of PD remains negligible. In a study using a nationwide inpatient sample, less than 1% of KF patients with cirrhosis and ascites were initiated on PD.13 There are several concerns—namely, higher risks of infections or technique failure, excessive albumin loss, poor candidacy for combined kidney-liver transplant, and overall poor outcomes—that raise doubts over the viability of PD in KF patients with ascites (Box 1).14,19,21,23

While there may be potential drawbacks to PD such as albumin loss, inherent risk of peritonitis, and the need for a stable home and psychosocial situation, there are many potential benefits that may outweigh the risks. PD provides slow and steady-state treatment that maintains hemodynamic stability and provides continuous drainage of ascites with daily exchanges. Because PD does not require anticoagulation, it can potentially reduce the risk of hemorrhage. Additionally, PD may serve as a much needed source of calories in malnourished KF patients with ascites (Box 1).16 Therefore, PD should be considered a viable and perhaps the preferred dialysis option in KF patients with ascites.

Outcomes of PD in Patients With KF and Ascites

Impact of Nutritional Status

Patients with advanced cirrhosis and ascites are considerably malnourished due to inadequate dietary intake, impaired digestion and absorption, and altered metabolism of nutrients.37 In addition, cirrhosis is associated with reduced synthesis of creatine, the precursor of creatinine. This may lead to lower serum creatinine levels in patients with cirrhosis, resulting in overestimation of the glomerular filtration rate. Thus, the diagnosis of KF and initiation of dialysis can be delayed, which may result in a persistent uremic state and further worsening of the patient’s nutritional status.38,39

Hypoalbuminemia is a predictor of mortality in KF patients and an independent risk factor for peritonitis in PD.40-42 Hence, given low baseline serum albumin levels in patients with KF and ascites, concerns have been raised that excessive loss of proteins in PD effluent may exacerbate hypoalbuminemia and result in poor clinical outcomes. However, most of the available data do not support

Box 1. Potential Advantages and Disadvantages of Peritoneal Dialysis in Patients With Kidney Failure and Ascites

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
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<tbody>
<tr>
<td>Better hemodynamic stability</td>
<td>Protein loss in dialysate effluent</td>
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<tr>
<td>No need for anticoagulation</td>
<td>Risk of peritonitis</td>
</tr>
<tr>
<td>Lower risk of hepatitis B and C virus transmission</td>
<td>Potential risks of pericatheter leaks, hernia, and other mechanical complications</td>
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<tr>
<td>Continuous drainage of ascites—no need for serial therapeutic paracentesis</td>
<td>Need for stable home situation</td>
</tr>
<tr>
<td>Provision of caloric load</td>
<td>Inability to perform peritoneal dialysis in the setting of physical or mental incapacity in the absence of assistance</td>
</tr>
</tbody>
</table>
this notion. One study comprising 11 KF patients with cirrhosis observed no change in serum albumin at 6 and 12 months after PD initiation.\textsuperscript{19} In contrast, a small but nonsignificant reduction in serum albumin from baseline was seen in 2 observational studies in patients with KF, cirrhosis, and ascites, with mean follow-up times of 4.5 and more than 6 years, respectively.\textsuperscript{21,43} Interestingly, Selgas et al\textsuperscript{18} reported excessive protein losses (more than 30 g/d) in the PD effluents initially, but these significantly decreased subsequently to 7-15 g/d among 8 KF patients with ascites. In parallel, the serum albumin level increased after an initial drop in an inverse relation to the peritoneal protein loss.\textsuperscript{18} Conceivably, an increase in intra-abdominal pressure generated by PD fluid may counter portal pressure and thereby reduce the formation of ascites and ensuing protein losses.\textsuperscript{44}

In summary, a majority of patients tolerate PD well, with minimal change in serum albumin.\textsuperscript{19,21,43} Protein losses are initially high but reduce with time.\textsuperscript{18} Even with the daily loss of protein in peritoneal fluid, a significant change in serum albumin from the baseline value is not observed.\textsuperscript{18,19,21}

### Infections and Peritonitis

Cirrhosis facilitates translocation of gut microorganisms, particularly Escherichia coli and other Gram-negative bacteria, into the peritoneum, which in concurrence with reduced function of peritoneal phagocytes and complement deficiency causes spontaneous bacterial peritonitis.\textsuperscript{45–48} There are concerns that PD may compound the risk of peritonitis by adding PD catheter–related peritonitis risks to the inherent risk of spontaneous bacterial peritonitis in these patients. However, most of the recent data suggest that this may not be the case (Table 1).

Although 1 small observational study of 11 patients did report 2.5-fold higher peritonitis rates in KF patients with cirrhosis and ascites as compared with noncirrhotic PD patients,\textsuperscript{18} several other studies have reported similar rates of peritonitis in cirrhotic and noncirrhotic PD patients with ascites.\textsuperscript{19,21,31,44,49} Jones et al\textsuperscript{21} reported a peritonitis rate

### Table 1. Experience and Outcomes of PD in Patients With Kidney Failure and Ascites

<table>
<thead>
<tr>
<th>Study</th>
<th>Patients</th>
<th>Follow-up Period</th>
<th>Peritonitis Rate</th>
<th>Mechanical Complications</th>
<th>PD Technique Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marcus et al\textsuperscript{49}</td>
<td>9 with CLD and ascites</td>
<td>3 mo to 8 y</td>
<td>1 episode/1.2 patient-years</td>
<td>1 puncture leak (resolved by holding PD)</td>
<td>2</td>
</tr>
<tr>
<td>Chow et al\textsuperscript{44}</td>
<td>25 with hepatitis B cirrhosis; 36 with hepatitis B and no cirrhosis</td>
<td>Mean FU: 52 mo</td>
<td>1 episode/19.2 patient-months (cirrhotic) vs 1 episode/20.5 patient-months (noncirrhotic)</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Bajo et al\textsuperscript{23}</td>
<td>5 with cirrhosis with ascites</td>
<td>8-66.5 mo</td>
<td>1 episode/24 patient-months</td>
<td>4 abdominal hernias (surgically corrected)</td>
<td>1</td>
</tr>
<tr>
<td>Huang et al\textsuperscript{31}</td>
<td>30 with cirrhosis (16 with ascites); 60 noncirrhotic</td>
<td>24-y experience</td>
<td>0.56 episode/year (cirrhotic) vs 0.39 episode/year (noncirrhotic)</td>
<td>Higher incidence of umbilical hernia in cirrhotic vs noncirrhotic group (5 vs 1)</td>
<td>No difference between groups (6 cirrhotic, 12 noncirrhotic)</td>
</tr>
<tr>
<td>De Vecchi et al\textsuperscript{19}</td>
<td>21 with cirrhosis; 41 noncirrhotic</td>
<td>Jan 1985-Dec 1999</td>
<td>Overall rate: 0.31 episode/year (no difference between groups)</td>
<td>None</td>
<td>No difference between groups (6 cirrhotic, 12 noncirrhotic)</td>
</tr>
<tr>
<td>Lee et al\textsuperscript{21}</td>
<td>33 with cirrhosis (13 with ascites); 33 propensity-matched controls</td>
<td>Mean duration: 46.1 mo</td>
<td>1 episode/87.1 patient-months (cirrhotic) vs 1 episode/149 patient-months (control): NS difference</td>
<td>No difference between groups (6 cirrhotic, 5 control)</td>
<td>No difference between groups (9 cirrhotic, 5 control)</td>
</tr>
<tr>
<td>Selgas et al\textsuperscript{18}</td>
<td>8 with cirrhosis with ascites</td>
<td>NA</td>
<td>1 episode/9 patient-months (2.5× higher than average incidence)</td>
<td>4 abdominal hernias (corrected surgically)</td>
<td>NA</td>
</tr>
<tr>
<td>Jones et al\textsuperscript{21}</td>
<td>12 with liver cirrhosis (7 with ascites)</td>
<td>Mean FU: 54 mo</td>
<td>0.2 episode/year</td>
<td>NA</td>
<td>None</td>
</tr>
</tbody>
</table>

Abbreviations: CLD, chronic liver disease; FU, follow-up; NA, not available; NS, not statistically significant; PD, peritoneal dialysis.
of 0.2 episodes per patient per year in 12 cirrhotic PD patients (58% with ascites), which was not different from that in noncirrhotic PD patients. In a larger report, no significant difference in peritonitis rate was observed between 25 patients with hepatitis B cirrhosis and 36 hepatitis B patients without cirrhosis. Likewise, no difference in peritonitis-free survival was observed between 30 cirrhotic and 60 noncirrhotic PD patients with 24 years of follow-up.11

Although the rates of peritonitis may be similar between cirrhotic and noncirrhotic PD patients, the causative organisms may differ. One study reported gut-dwelling Streptococcus, E coli, and other Gram-negative bacteria caused 43% of the peritonitis cases in cirrhotic PD patients, compared with only 20% in noncirrhotic patients. By contrast, another study reported that more than 50% of peritonitis cases in cirrhotic patients resulted from Gram-positive bacteria, suggesting a breach of sterile technique. Notwithstanding the cause of peritonitis, the majority of cases were successfully treated with intraperitoneal antibiotics without causing technique failure.18,21,49

**Patient Survival and Hemodynamic Stability**

There has been a general bias against using PD in patients with KF and ascites, but several observational studies have reported the successful use of PD in this population (Table 1). In a series of 9 KF patients with cirrhosis and ascites, survival up to 8 years was observed, with 6 of the 9 patients surviving more than 18 months with good control of uremic symptoms and volume status. Similar observations were made in 2 series of 5 and 8 KF patients with cirrhosis, who demonstrated good hemodynamic tolerance with PD. In fact, 3 of these patients were transferred from HD due to persistent hemodynamic instability.18,23

In all studies, mortality was related to complications of cirrhosis and not from PD-associated issues. In a more recent single-center observational study of 12 patients with KF and cirrhosis (58% with ascites), no deaths or PD technique failure were observed over a mean follow-up of 4.5 years.21

Not many studies have compared mortality between HD and PD among KF patients with ascites (Table 2). A study from South Korea reported similar mortality between the 2 dialysis modalities over 38 months’ follow-up in cirrhosis patients, and another observational study from the People’s Republic of China reported significantly lower all-cause mortality with PD as compared with HD in KF patients with cirrhosis with an average follow-up period of 6 years. Likewise, among hospitalized individuals, there was a nonsignificant mortality difference between the KF patients with cirrhosis who were treated with PD versus HD. However, among the subgroup of KF patients with ascites, PD had a significantly lower in-hospital mortality compared with HD.

Taken together, the available evidence, though based on small case series, indicates that PD is a viable option among patients with KF and cirrhosis with ascites, and has similar outcomes compared with cirrhotic KF patients with ascites undergoing HD.

**Logistics of Peritoneal Dialysis Initiation in KF Patients With Ascites**

**Patient Selection**

PD should be considered in KF patients with ascites. Importantly, dialysis modality education should be provided to patients and family members, expeditiously if urgent-start dialysis is expected. Home evaluations should be conducted to determine if the conditions are safe and supportive of PD. In addition, these patients should be evaluated by a multidisciplinary team including nephrologists, surgeons, hepatologists, and other co-managing

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**Table 2. Comparison of Outcomes Between HD and PD in Patients with Kidney Failure and Liver Cirrhosis and Ascites**

<table>
<thead>
<tr>
<th>Study</th>
<th>Patients</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nader et al28</td>
<td>26,135 cirrhotic patients with incident KF (25,686 HD; 449 [1.7%] PD; 1,878 with ascites, of which 18 [0.96%] on PD)</td>
<td>In-hospital mortality: no significant difference between PD and HD; among subgroup with ascites, significantly lower with PD vs HD (0 vs 26.67; ( P = 0.03 )) Hospital LOS: longer in HD vs PD (8.34 vs 7.06 d; ( P &lt; 0.001 )) In-hospital charges: higher with HD vs PD ($74,501 vs $57,460; ( P &lt; 0.001 ))</td>
</tr>
<tr>
<td>Chou et al43</td>
<td>Cohort 1: 85 PD and 340 HD patients with KF and cirrhosis; cohort 2: 279 PD and 1,116 HD patients with cirrhosis and KF; prevalence of ascites not available</td>
<td>Lower mortality among PD vs HD patients in cohort 1 (HR, 0.48 [95% CI, 0.31-0.74]; ( P &lt; 0.01 ); average FU of 6 y) and cohort 2 (HR, 0.61 [95% CI, 0.47-0.79]; ( P &lt; 0.01 ); FU duration NA)</td>
</tr>
<tr>
<td>Kim et al28</td>
<td>44 KF patients with cirrhosis (33 on HD [11 with ascites], 11 on PD [1 with ascites])</td>
<td>No difference in mortality between HD and PD patients (( P = 0.562 ))</td>
</tr>
<tr>
<td>Chien et al30</td>
<td>40 PD and 703 HD patients with KF and cirrhosis (prevalence of ascites not given)</td>
<td>Liver cirrhosis is an important predictor of mortality in KF, but the effect on mortality was not different between HD and PD patients</td>
</tr>
</tbody>
</table>

Abbreviations: FU, follow-up; HD, hemodialysis; HR, hazard ratio; KF, kidney failure; LOS, length of stay; NA, not available; PD, peritoneal dialysis.
teams for any medical, psychosocial, and surgical barriers to PD.

There are a few contraindications to use of PD in KF with ascites. Patients with a poor home situation, who are not motivated, or who have malignant ascites are not candidates for PD.\textsuperscript{50,51} Additionally, patients with recent abdominal surgery, acute bowel inflammation, and uncorrected hernias are not eligible for PD. Moreover, acute liver failure, acute hepatitis, hepatorenal syndrome, or severe chronic hepatitis with severe coagulopathy (prothrombin time greater than 3 seconds despite vitamin K administration, or platelet count of less than 50,000/dL) are also considered as contraindications for surgery.\textsuperscript{49,52} Similarly, patients with hepatic encephalopathy are not PD candidates, unless the option for assisted PD, either at home or in a nursing facility, is available.

In general, patients with ascites from cirrhosis are at higher risk for perioperative complications such as bleeding, hypotension, and liver injury from drugs used during anesthesia. Preoperative planning in these patients should be meticulous and should take into consideration the severity of liver disease, type of surgery, and the method of anesthesia so as to allow patient optimization and even consideration for alternative procedures such as percutaneous placement or bridge with HD until the patient can be optimized for general anesthesia.\textsuperscript{49,52,53}

**PD Catheter Placement**

Currently, there is no unanimity on optimal PD catheter insertion technique in KF patients with ascites. Nephrologists at one center placed PD catheters by the percutaneous technique,\textsuperscript{49} but the open surgical technique was employed by others.\textsuperscript{18,19,23,54} Similarly, successful laparoscopic PD catheter placement has been described in this patient population.\textsuperscript{55} Neither bleeding complications nor intestinal perforations have been reported to occur more often in patients with KF and ascites.\textsuperscript{18} Even in patients with prolonged coagulation times, successful percutaneous catheter placement has been performed without bleeding complications.\textsuperscript{49}

Overall, the risks of mechanical complications after PD catheter placement in KF patients with ascites have been quite low and can be successfully managed without causing technique failure (Table 1). De Vecchi et al\textsuperscript{19} observed no surgical or mechanical problems in 21 patients with KF and cirrhosis (12 patients with ascites). One study reported a higher incidence of umbilical hernia in cirrhotic KF patients, but no difference in catheter migration, leakage, or hydrothorax when compared with noncirrhotic KF patients.\textsuperscript{54} Marcus et al\textsuperscript{55} observed pericatheter leak in 1 patient, which resolved with temporarily discontinuing PD for 2 days. Bajo et al\textsuperscript{23} noted the development of abdominal hernia in 4 patients with KF and ascites; in each case this was corrected without discontinuation of PD (Table 1). Likewise, no significant difference in technical complications was observed between KF patients with cirrhosis (40% had ascites) and propensity-matched noncirrhotic KF patients (Table 1).\textsuperscript{55}

Although the current guidelines do not recommend a particular catheter placement procedure for this special population, the health care professional who performs the procedure (surgeon, nephrologist, or interventional radiologist) and the technique (open-surgical, laparoscopic, or percutaneous) should be determined by center experience and the established mechanism for catheter placement at the individual site. Perioperative antibiotics should be administered to reduce the incidence of early peritonitis. The choice of prophylactic antibiotic should depend upon the spectrum of antibiotic resistance of the individual center.\textsuperscript{56}

**PD Initiation**

Unless there are medical reasons for urgent-start PD in the hospital, the patient should be seen in the outpatient PD center within 7 days after PD catheter placement. During the initial evaluation, the urgency of starting PD should be determined based on assessment of volume status and uremic symptoms. If there is no immediate need to initiate PD, initiation can be delayed 2–4 weeks to promote healing of the surgical site and reduce the risks of catheter complications.\textsuperscript{57} However, even if PD initiation is delayed, the ascites fluid should be frequently drained and the catheter concomitantly flushed to ensure patency and monitor any leaks (Fig 1).

There is no unanimity on the amount of ascites fluid to be initially drained. Drainage of 5–6 L of ascites fluid has been described on the initial visit in patients with tense ascites.\textsuperscript{18} On subsequent visits, different strategies have been used to determine the volume of ascites fluid to be drained. Some centers have drained 10% to 20% extra fluid over the instilled fill volume (FV) with every exchange.\textsuperscript{18,23} Others have drained 400–600 mL above the instilled FV until the ascites fluid is completely drained.\textsuperscript{19,54,58} Still others have not specified the volume of ascites drained on each visit.\textsuperscript{21} Some centers have infused albumin while draining ascites, while others have not.\textsuperscript{18,19,21,23,54,58}

There is no consensus on the initial dialysate FV to be instilled. While Selgas et al\textsuperscript{18} initiated with 2 L FV from the outset, De Vecchi et al\textsuperscript{19} started with 1,000 mL, and Lee et al\textsuperscript{23} used 500 mL with stepwise increase to 2 L. In general, a typical starting FV is 500–750 mL. Every 3–4 days, the FV should be gradually increased, as tolerated, while being vigilant for catheter leaks and overfills, until the patient reaches a maximum prescribed FV, usually 1.5–2.5 L and usually in 2–4 weeks. All exchanges and drains should be performed in supine position until the catheter site is completely healed (Fig 1).

In summary, the amount of ascites fluid drained and the FV of the infused dialysate should be set depending
on the size and comfort of the patient. The tonicity of the dialysate and number and frequency of PD exchanges are dictated by the hemodynamic state, severity of symptoms, and volume status. When urgent start is needed, typically 2-5 exchanges over 4-6 hours a day are performed by the PD nurse, 2-5 days a week, with frequent adjustments of the PD prescription according to the patient’s clinical status. If urgent start is not needed, PD flushes with concurrent ascites fluid drainage should be done frequently, typically 1-3 times a week, depending on the clinical situation and the patient’s schedule.

**PD in KF With Ascites and Liver Transplant**

Simultaneous kidney and liver transplant (SLKT) is considered the preferred option in patients with concomitant liver and kidney failure needing transplant. Patients with KF who receive liver transplant alone and remain on dialysis have poor allograft and patient survival. On the other hand, compared with liver transplant alone, SLKT is more cost effective. Moreover, SLKT is associated with lower exposure to anesthesia and the related risks, as compared to liver transplant alone followed by kidney transplant.

There are perceptions that initiating PD in patients with KF and ascites will hamper their candidacy for liver transplant. However, data to support this dogma are lacking. In fact, in a study of 12 PD patients with KF and cirrhosis (7 with ascites), 3 patients underwent successful SLKT, 4 additional patients remained active on the transplant wait-list, and 5 were deemed not transplant candidates due to comorbidities. By the same token, PD has been successfully performed in liver transplant recipients who later develop KF.

**Outcome of the Clinical Vignette and Summary**

The patient eventually had a PD catheter placed by the transplant surgeon. He did very well on PD. His volume status improved, and his blood pressure remained stable. He did not require any LVP while on PD. He had 1 episode of peritonitis caused by coagulase-negative Staphylococcus, suggesting a breach in sterile technique as the root cause rather than spontaneous bacterial peritonitis. After about 3 years on PD, he received SLKT.

In summary, PD is a viable dialysis modality in patients with KF and ascites. It provides hemodynamic stability and facilitates better volume management compared with HD. Moreover, it provides continuous drainage of ascites, thus mitigating the need for LVP. PD potentially reduces hemorrhagic complications by avoiding routine anticoagulation use. Moreover, the outcomes such as peritonitis and mechanical complications are comparable to the control PD population. Although there may be initial drop in serum albumin level, this is short-lasting and does not affect the overall outcomes. Furthermore, PD does not affect transplant candidacy and these patients can successfully receive SLKT.

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Support: This work was supported by the George M. O’Brien Kidney Research Core Center (US National Institutes of Health grant P30DK079328) (to RS). The funders had no role in defining the content of this review.

Financial Disclosure: The authors declare that they have no relevant financial interests.

Peer Review: Received January 15, 2021 in response to an invitation from the journal. Evaluated by 2 external peer reviewers and a member of the Feature Advisory Board, with direct editorial input from the Feature Editor and a Deputy Editor. Accepted in revised form April 13, 2021.

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AJKD Vol 78 | Iss 5 | November 2021

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