



Is PD, as a good choice modality for the patients with Cirrhotic ascites?

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Outlines

- Ascites in ESRD patients: Nephrogenic ascites
- Ascites in ESRD & ESLD patients: workup
- Managing with HD or PD?
- Benefits and disadvantages of PD.
- Recommended program for PD in ascites

Clinical Vignette 1

- 27-year-old woman on hemodialysis (diagnosed in December 2017)
- CC: intractable abdominal pain, nausea and vomiting started 2 days prior.
- PMH:
 - Diabetes type 1 from the age of 11 years Bilateral diabetic retinopathy
 - ESRD secondary to diabetic nephropathy Anxiety
 - Hypertension Ovarian cyst
- The patient has a history of multiple admissions with similar presentations.

Case Report



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A Real Neglected Problem With a Grave Prognosis: Nephrogenic Ascites

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Clinical Vignette 1

- She was pale but had no jaundice or lymphadenopathy.
- BP= 218/108 mm Hg.
- Her cardiac and respiratory exam was unremarkable.
- Abdominal examination:
 - Abdominal distension
 - Mild tenderness
 - Positive shifting dullness
 - The normal bowel sounds
 - No dilated veins and no palpable masses
- Extremities exam was remarkable for **bilateral +1 leg edema**.

Clinical Vignette 1

- Laboratory data:
- BUN= 42 mg/dL Cr= 6.1 mg/dL
- Calcium= 8.8 mg/dL. Ph= 4.8 mg/dL
- WBC= 12000 Hb= 9.6g/L Plt= 428000
- INR= NL
- CT scan of the abdomen/pelvis with IV/Po contrast: moderate to be marked as abdominal ascites with hepatomegaly and a somewhat reticular pattern of enhancement suggesting possible cirrhosis.
- Hepatitis B and C serology had been negative
- LFT: within normal limits.

Clinical Vignette 1

Therapeutic/diagnostic paracentesis:

WBC: 92/ μ L RBC: 5,120/ μ L
PMN: 0%. MN: 0%
Lymphocytes: 34%
Unclassified cell: 66%

Glucose: 134 mg/dL
Total protein: 5.7g/dL
Albumin: 2.0g/dL
LDH: 226 IU/L
Amylase: 25 IU/L

Culture of ascitic fluid : Negative

Serum albumin: 2.7 g/dL. SAAG: 0.7

Cytology: chronic inflammatory and rare mesothelial cells, and no malignant cells were identified.

With predominance of lymphocytic cells : AFB and IGRA: Negative

Clinical Vignette 1

- Doppler US (hepatobiliary): did not show any finding suggesting portal vein thrombosis or Budd-Chiari syndrome.
- Echo did not show any elevation in right ventricular pressure with ejection fraction (EF) of 60%.
- Based on the detailed workup, hepatic, cardiac, infectious and malignant causes for ascites were ruled out.
- The diagnosis of ascites of **nephrogenic origin** was made.

Nephrogenic ascites

- Nephrogenic ascites: as a clinical condition of refractory ascites in patients with ESRD on renal replacement therapy.
- This entity was first described in 1970.
- Other names:
 - Nephrogenous ascites
 - Dialysis ascites
 - HD-associated ascites
 - Idiopathic ascites

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**Saudi Journal
of Kidney Diseases
and Transplantation**

Case Report

Nephrogenic Ascites – Still an Intractable Problem?

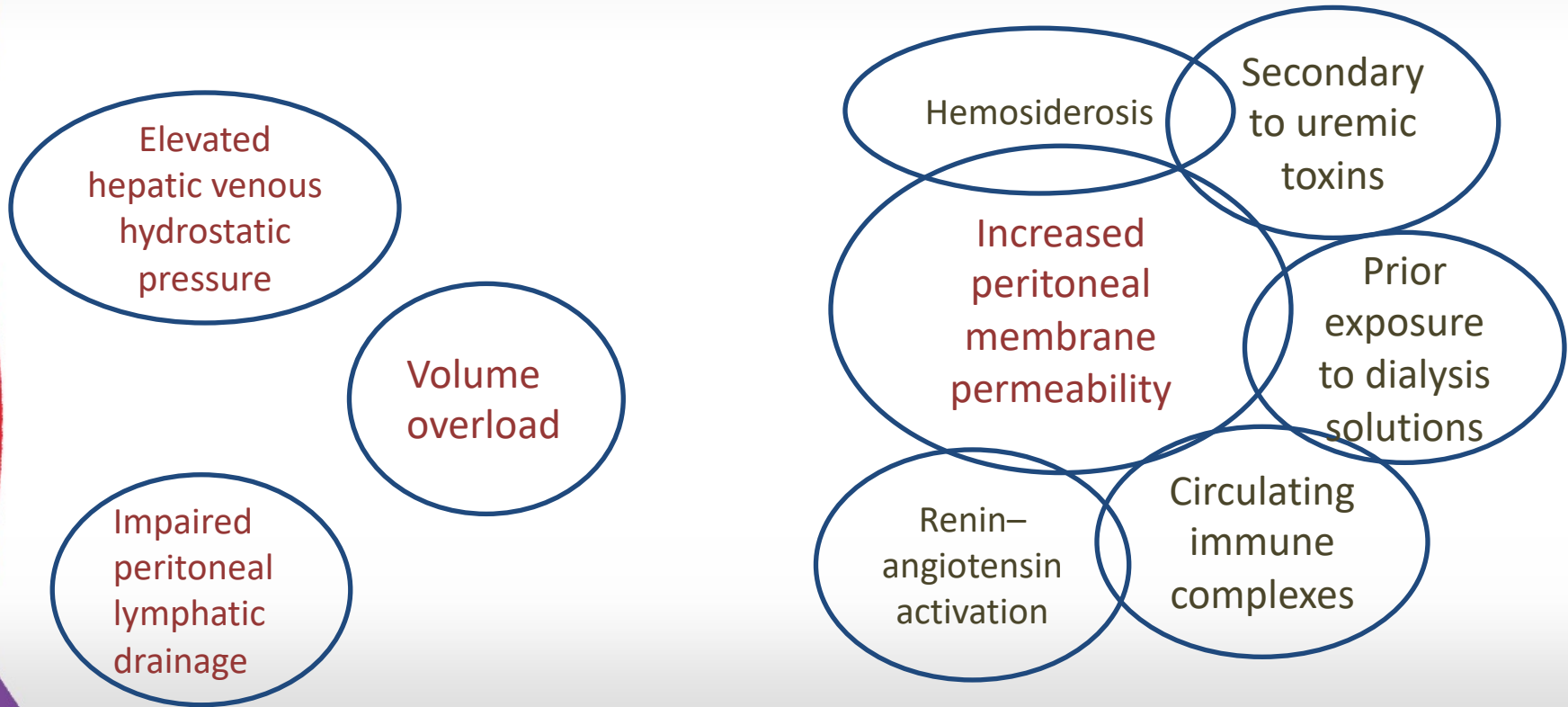
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Nephrogenic ascites

- An important note:
 - The onset of ascites may occur earlier in the course of renal failure and well before the initiation of dialysis.
- Nephrogenic ascites could be possibly due to a combination of factors:
 - Poor nutrition
 - Late presentation leading to delay in initiation of appropriate renal replacement therapy
 - **Inadequate dialysis**
 - Uremia
 - Increased peritoneal membrane permeability

Possible pathogenetic mechanisms for nephrogenic ascites



Incidence

- Marked center to center variability
- 0.7–20%
- Wide age of onset of 11–71 years (mean 42 years)
- Male preponderance: (male : female = 2:1)
- Poor survival (7.0-10.7 months)

Recommended evaluation for nephrogenic ascites

- History and physical examination: History of massive ascites with minimal peripheral edema in dialysis patient, cachexia, dialysis-related hypotension, anorexia.
- General blood chemistries including liver function tests
- Paracentesis and ascitic fluid analysis for low SAAG (<1.0 g/dL), WBC count 25–150 cells/mm³), negative culture and cytology

Recommended evaluation for nephrogenic ascites

Thyroid function tests	Estimation of iron studies	Hepatitis viral markers
PTH	Abdominal CT	Peritoneoscopy with peritoneal biopsy: -peritoneal infection/malignancy, -pancreatic causes -cardiac causes such as cardiomyopathy and pericardial effusions
Ultrasound abdomen with portal venous Doppler	Echocardiogram with right and left atrial pressure estimation	

Therapeutic options for nephrogenic ascites

Modality	Benefit	Drawback
Fluid and salt restriction with intensified HD & UF	Decreases ascites	Limited by hypotension
Hyperalimentation therapy	Improves nutrition	Not proven
Repeated paracentesis	Reduces symptoms	Excess protein losses
CAPD	Reduces ascites/improves nutrition	Self-limited early protein loss
Peritoneovenous shunt	Reduces ascites, dialysis	Shunt infection/blockage
Kidney transplant	Definitive therapy	Ascites may recur after graft failure

Clinical Vignette 2

- A 65-year-old man has history of hypertension, type 2 DM, hepatitis C–related cirrhosis with ascites, and progressive CKD due diabetic nephropathy.
- In the past 3 months, he was hospitalized twice with episodes of SBP and hepatic encephalopathy.
- Lately he had required frequent LVP.
- His MELD score was 21.

Clinical Vignette 2

- His CKD had progressed to stage 5, and he had been educated about RRT options.
- He expressed a preference for 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.

Clinical Vignette 2

- Consequently, he was initiated on in-center (HD).
- He did not tolerate UF due to persistent hypotension and remained volume overloaded.
- He still needed frequent LVP to manage his ascites.
- *Should this patient be reconsidered for PD?*

Incidence

- Incidence of cirrhosis in KF:
 - 4% to 6% incidence,(in Small studies from Asia)
- Incidence of ascites: unreported
- The presence of cirrhosis increases the overall mortality risk in KF patients.
- The cirrhotic patients had a significantly lower 1-, 3-, and 5-year survival compared with noncirrhotic KF patients.

ORIGINAL ARTICLE

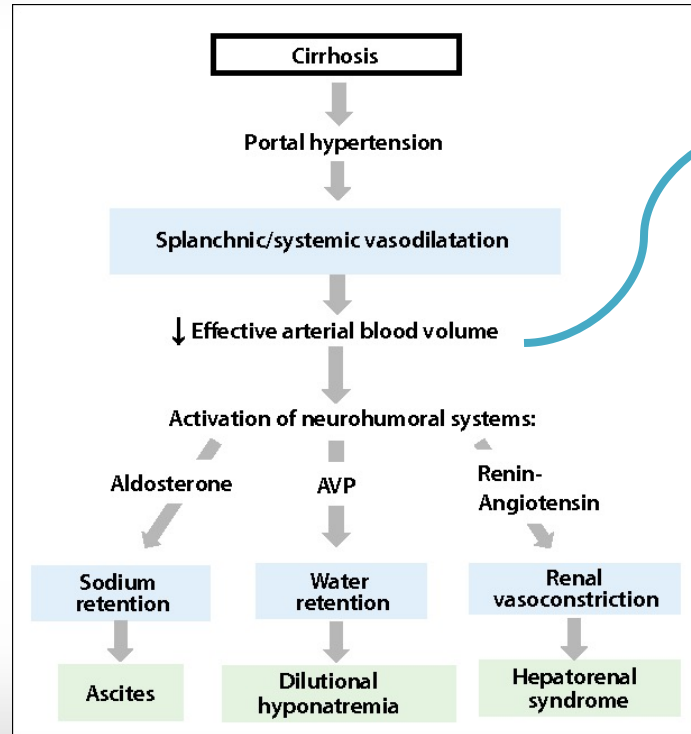
Korean J Intern Med 2014;31:730-738
<http://dx.doi.org/10.3904/kjim.2014.328>



Liver cirrhosis leads to poorer survival in patients with end-stage renal disease

Ae Jin Kim, Hye Jin Lim, Han Ro, Ji Yong Jung, Hyun Hee Lee, Wookyoung Chung, and Jae Hyun Chang

Problems with HD in Ascitic patients



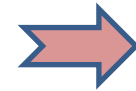
Rapid removal of fluid from the intravascular compartment during HD



Severe hypovolemia and hypotension



Preclude adequate ultrafiltration



- Insufficient fluid removal
- Progressive volume overload
- Worsening ascites
- Uremic state: Encephalopathy

Other problems with HD

- Bleeding in cirrhotic pts and HD:
 - Abnormalities of hemostatic function in cirrhosis: risk of bleeding as well as thrombosis
 - Coexisting uremia: exacerbation of platelet dysfunction
 - Use of anticoagulation in HD

How about PD?

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

Advantages

- 😊 Better hemodynamic stability
- 😊 No need for anticoagulation
 - Lower risk of hepatitis B and C virus transmission
 - Continuous drainage of ascites—no need for serial therapeutic paracentesis
- 😊 Provision of caloric load

Disadvantages

- Protein loss in dialysate effluent
- Risk of peritonitis
- Potential risks of pericatheter leaks, hernia, and other mechanical complications
- Need for stable home situation
- Inability to perform peritoneal dialysis in the setting of physical or mental incapacity in the absence of assistance

Protein loss in PD

Study	Materials	Results
Outcome of peritoneal dialysis in cirrhotic patients with chronic renal failure(Vecchi AF et al, 2002)	11 KF patients with cirrhosis	No change in albumin at 6 & 12 months after PD initiation
Peritoneal Dialysis Is Feasible as a Bridge to Combined Liver-Kidney Transplant(Jones, 2017)	12 KF patients with cirrhosis	Small but nonsignificant reduction in Alb(4.5y)
Peritoneal Dialysis is Associated With A Better Survival in Cirrhotic Patients With Chronic Kidney Disease(Chou, 2016)	Comparing 340 HD & 85 PD	Small but nonsignificant reduction in Alb(6y)
Peritoneal dialysis in the comprehensive management of ESRD patients with liver cirrhosis and ascites: practical aspects and review of the literature (Selgas, 2008)	8 KF patients with ascites	excessive protein losses (> 30 g/d) initially, significantly decreased to 7-15 g/d

Conclusions

- Overall there were no significant changes in albumin from baseline values in these small patient groups.
- The *increase in intra-abdominal pressure* generated by PD fluid may *counter portal pressure and reduce the formation of ascites*.

Infections and Peritonitis

- Cirrhosis facilitates translocation of gut microorganisms: E-coli and other Gram-negative bacteria ➡ SBP.
- *Q: PD may compound the risk of peritonitis by adding PD catheter-related peritonitis?*

Experience and Outcomes of PD in Patients With Kidney Failure and Ascites

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

Infections and Peritonitis

**Similar rates of peritonitis in cirrhotic and noncirrhotic PD patients with ascites.

Although the **rates of peritonitis may be similar between cirrhotic and noncirrhotic PD patients, the **causative organisms** may differ.

	Origin	Organism	Cirrhotic	Noncirrhotic
1	Gut-dwelling	Streptococcus, E coli, and other Gram-negative	43%	20%
2	breach of sterile technique	Gram positive bacteria	more than 50%	

Patient Survival and Hemodynamic Stability

- 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.

Peritoneal Dialysis is Feasible as a Bridge to Combined Liver-Kidney Transplant

Ruth Ellen Jones, Yun Liang, Malcolm MacConmara, more...


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<https://doi.org/10.3747/pdi.2017.00124>

Comparison of Outcomes Between HD and PD in Patients with Kidney Failure and Liver Cirrhosis and Ascites

Study	Patients	Outcomes
Nader et al ³⁵	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)	 In-hospital mortality: no significant difference between PD and HD; among subgroup with ascites, significantly lower with PD vs HD (0 vs <u>26.67</u> ; $P = 0.03$) Hospital LOS: longer in HD vs PD (8.34 vs 7.06 d; $P < 0.001$) In-hospital charges: higher with HD vs PD (\$74,501 vs \$57,460; $P < 0.001$)
Chou et al ⁴³	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	Lower mortality among PD vs HD patients in cohort 1 (HR, 0.48 [95% CI, 0.31-0.74]; $P < 0.01$; average FU of 6 y) and cohort 2 (HR, 0.61 [95% CI, 0.47-0.79]; $P < 0.01$; FU duration NA)
Kim et al ²⁸	44 KF patients with cirrhosis (33 on HD [11 with ascites], 11 on PD [1 with ascites])	No difference in mortality between HD and PD patients ($P = 0.562$)
Chien et al ³⁰	40 PD and 703 HD patients with KF and cirrhosis (prevalence of ascites not given)	Liver cirrhosis is an important predictor of mortality in KF, but the effect on mortality was not different between HD and PD patients

Conclusion

- 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.

Who is suitable for PD?

Contraindicate	Not eligible	Contraindications for surgery
Poor home situation	Recent abdominal surgery	Acute liver failure
Not motivated	Acute bowel inflammation	Acute hepatitis
Malignant ascites	Uncorrected hernias	Hepatorenal syndrome
Patients with hepatic encephalopathy are not PD candidates , unless the option for assisted PD, either at home or in a nursing facility, is available.		Severe chronic hepatitis with severe coagulopathy (PT > 3" despite vit K administration, or PLT < 50,000/dL)

Surgery for PD

- Patients with ascites from cirrhosis: higher risk for perioperative complications: bleeding, hypotension, and liver injury from anesthesia drugs
- Preoperative planning:

The severity of liver disease

Type of surgery

The method of anesthesia

PD Catheter Placement

- The current guidelines **do not recommend a particular catheter placement procedure** for this special population.
- Perioperative antibiotics should be administered.

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.
- 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.

PD Initiation

- 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

Amount of ascites drained

- Drainage of **5-6 L** of ascites fluid has been described on the initial visit in patients with tense ascites.
- On subsequent visits, different strategies for determining the drained volume.
 - Some centers have drained **10% to 20% extra fluid** over the instilled fill volume (FV) with every exchange.
 - Others have drained **400-600 mL above the instilled FV** until the ascites fluid is completely drained

Albumin ??

- Some centers have infused albumin while draining ascites, while others have not: **No consensus**

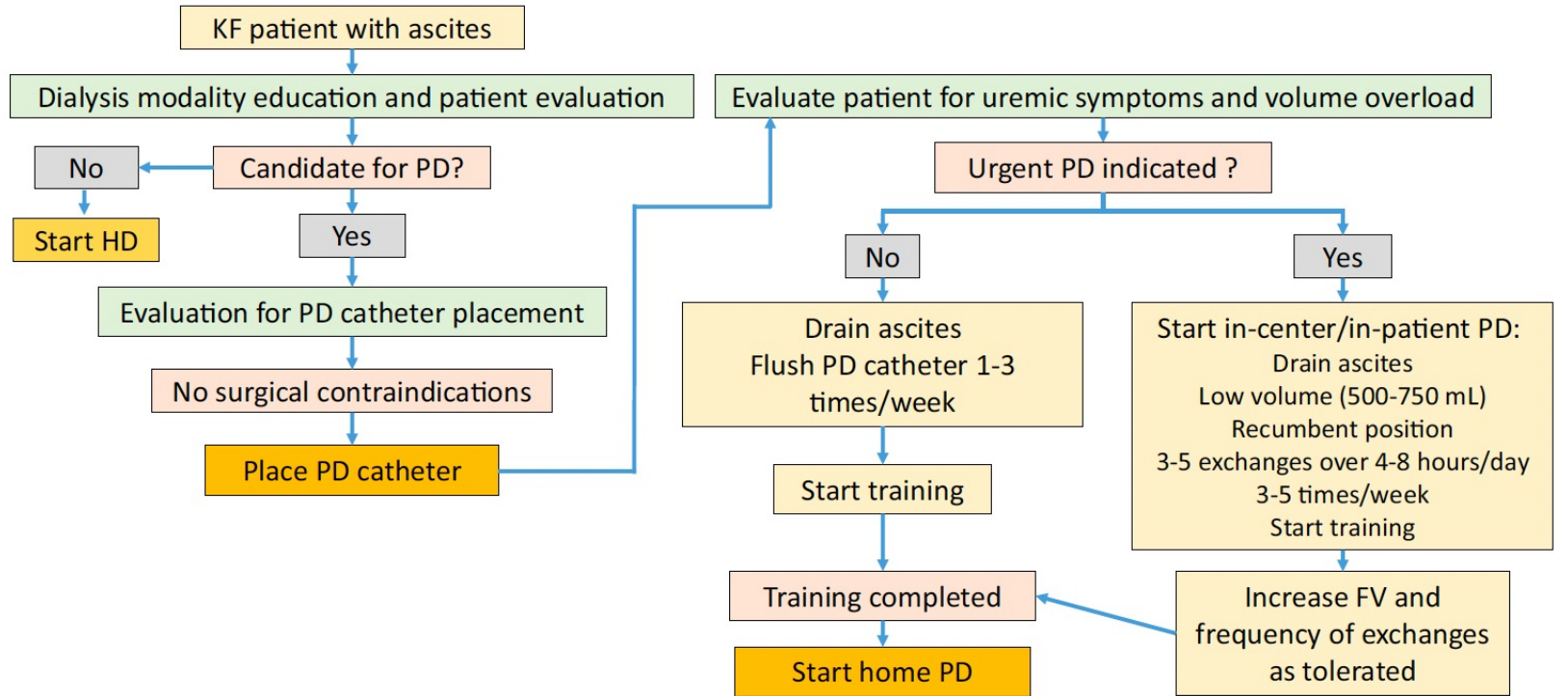
Initial dialysate FV to be instilled

- There is no consensus.
- 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

Initial dialysate FV to be instilled

- 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.

Initiation of peritoneal dialysis in patients with kidney failure with ascites



PD in KF With Ascites and Liver Transplant

- SLKT: 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.
- SLKT is associated with lower exposure to anesthesia and the related risks, as compared to LT alone followed by KT

PD and LT

- 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.
- PD has been successfully performed in liver transplant recipients who later develop KF

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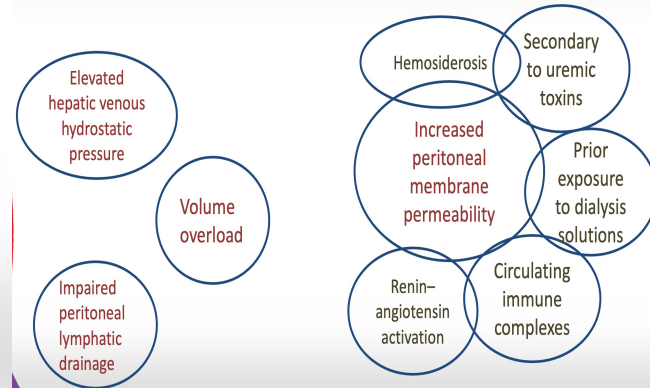


<https://doi.org/10.3747/pdi.2017.00124>

Take home messages

- Nephrogenic ascites: as a clinical condition of refractory ascites in patients with ESRD on renal replacement therapy.
- Therapeutic options for nephrogenic ascites:
 - Fluid and salt restriction with intensified HD & UF
 - Hyperalimentation therapy
 - Repeated paracentesis
 - CAPD
 - Peritoneovenous shunt
 - Kidney transplant

Possible pathogenetic mechanisms for nephrogenic ascites



Take home messages

- PD in cirrhotic patients with ascites: there were no significant changes in albumin from baseline values.
- 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.
- If there is **no immediate need** to initiate PD, initiation can be **delayed 2-4 weeks**.

More references

AJKD

In Practice Review

Peritoneal Dialysis Use in Patients With Ascites: A Review

Nilum Rajora, Lucia De Gregorio, and Ramesh Saxena



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