PD in the Acute Setting - Myth or Reality?

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Case

- 43 yo male with DM, CAD, CHF and CKD stage IV presents with AKI and creat of 6.8 and BUN 120. Uremic symptoms, no rub or ACS
- BNP of 12000 and mod pulm edema on CXR
- On transplant list for a DDRTx
- Admitted to the cardiac ICU on lasix gtt with oliguria
- What do you do next?
  - Place CVC and start hemodialysis
  - Place a PD catheter and start low volume supine acute PD

History

Background

The first references to the peritoneum was in 1550 BC in ancient Egypt. The term was described by the moricians during embalment. The work peritoneum refers to the greek "peritonaion" which means to stretch, since the membrane stretched around the organs and peritoneal cavity.

- This was termed by Galen, a greek physician who noted the membrane while treating injured gladiators.
- In 1862 F.D. von Recklinghausen described the structure as a layer of cells.

Using the peritoneal cavity for dialysis

- In 1923 Georg Ganter, a German physician, published the first clinical application of peritoneal dialysis.
- He developed this as he had reservations against hemodialysis
  - Time consuming
  - Invasiveness of extracorporeal circulation
  - Large and fragile dialyzing apparatus
  - The toxic effects of hirudin (anti-coagulant extracted from leeches).
- He wanted to use a natural membrane for dialysis
- In 1919 while working as an assistant he used the pleura as a membrane. He instilled 3/4L fluid and noted improvement in the uremic symptoms of a patient, who died a couple days later.
- He started experimenting on bilateral ureter-ligated rabbits and guinea pigs and used saline solutions in the peritoneum.

First peritoneal dialysis patient (AKI)

- His first peritoneal dialysis patient was a female with bilateral ureteral obstruction from uterine cancer
- He instilled a single infusion of 1.5L of physiological salt solution which she tolerated
- He then used varying volumes of 1-3L for 30min to 3hour dwells until her blood chemistries improved.
- Her symptoms were temporarily relieved but she did die a few days later.


Need for more developments

- When Georg Ganter died in 1940 13 patients worldwide had been treated by peritoneal dialysis
- With continued use the following problems were noted
  - Need for adequate access
  - Prevention of infections with sterile solution
  - Developing longterm use
  - Determining adequacy

Emerging issues in ESRD

- For hemodialysis patients incident in 2006–2007, rates of admission for all-cause infection in the first months of hemodialysis were highest in those initiating with a catheter or a catheter and maturing internal access.
- Hemodialysis patients using a catheter for dialysis access are the most likely to have at least one IV or oral antibiotic claim during the first six months of dialysis.

Do CVCs in HD affect Mortality Association compared to PD?

- 40,526 incident adult dialysis patients from the Canadian Organ Replacement Register (2001 to 2008).
- Compared with the 7412 PD patients, 1-year mortality was similar for the 6663 HD-AVF/AVG patients but was 80% higher for the 24,437 HD-CVC patients (adjusted HR, 1.8; 95% confidence intervals [CI], 1.6 to 1.9).
- During the entire period of follow-up, HD-AVF/AVG patients had a lower risk for death, and HD-CVC patients had a higher risk for death compared with patients on PD.

PDC Infections Same as AVF!

- Ishani et al, KI 68:311, 2005

Pros and Cons of PD in ICU

Pros
- Reduces infection risk of temp catheter (infections 2nd leading cause of death)
- Better preserves residual renal fun
- Better survival first two years
- Preserves vascular real estate for future AVF/Transplant
- Better transplant outcomes
- Costs less

Barriers
- Lack of PD champions
- Are sick patients best candidates for home therapy?
- Lack of RNs and training staff and space available
- Finding surgeons trained on the expert placement of PD catheters

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Survey Says…

- Gaiao, et al obtained 464 questionnaires in 2009
  - 378 (81.5%) were from the Vicenza PD course
  - 47 (10.1%) were from the ISHD Hong Kong congress
  - 39 (8.4%) were from the ISPD Vancouver meeting
- 36.1% of all respondents considered PD to be a suitable therapeutic option in most cases of AKI. By contrast, only 15.7% actually used PD in the ICU

Recent studies

Comparing CVVHDF vs PD in ICU

- George, et al randomized 50 patients to HDF vs PD
  - MOFS with APACHE of 18.4 and 17.8 respectively
- Primary outcome was the composite correction of uremia, acidosis, fluid overload, and hyperkalemia.
- Secondary outcomes were improvement of sensorium and hemodynamic instability, survival, and cost.
- Acidosis correction was better in PD group (p < 0.001). Correction of fluid overload was faster and the amount of ultrafiltrate was significantly higher in HDF (20.31 ± 21.86 L vs. 5.31 ± 5.75 L, p < 0.001).
- No significant differences were seen in correction of hyperkalemia, altered sensorium, or hemodynamic disturbance.
- Mortality was 84% in HDF and 72% in the PD group.

Metanalysis of PD in AKI

- Chionh, et al identified 24 studies (n=1556 patients) in their Medline and Cochrane search
  - Thirteen studies described patients (n=597) treated with peritoneal dialysis only; pooled mortality was 39.3%.
  - In 11 studies (7 cohort studies and 4 randomized trials), patients received peritoneal dialysis (n=392, pooled mortality=58.0%) or extracorporeal blood purification (n=567, pooled mortality=56.1%).
  - In the cohort studies, there was no difference in mortality between peritoneal dialysis and extracorporeal blood purification (odds ratio, 0.96; 95% confidence interval, 0.53 to 1.71).
  - In four randomized trials, there was also no difference in mortality (odds ratio, 1.50; 95% confidence interval, 0.46 to 4.86).
Chionh et al. CJASN 2013;8

What does the ISPD say??

- GUIDELINE A1: Suitability of peritoneal dialysis for AKI in adults
  - A1.1 Peritoneal dialysis should be considered as a suitable method of continuous renal replacement therapy in patients with acute kidney injury (1B).
  - A2.4 Peritoneal dialysis catheter insertion by nephrologists is safe and functional results equal to those inserted surgically (1B).
  - A2.5 We recommend that nephrologists receive training and be permitted to insert these catheters to ensure timely dialysis in the emergency setting (1B).
  - A2.8 A closed fluid delivery system with a Y connection should be used (1A) (Optimal).

Cullis, et al. PDI 2014;34

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How do we set up an urgent start program?

Arramreddy, et al. AJKD 2014;63

What type of PD protocol should we use?

Table 2: Urgent-Start PD Protocols

- We included
- Inclusion
- Exclusion
- Comparators
- Initial fluid volume
- Hours
- Frequency
- Outcome

- Coccia et al.: x Surgeon: 1.000, 0.0
- Guder et al.: x Hematocrit nadir: 10.0, 0.9
- Loeber et al. x Surgeon: 2.004, 0.0, 0.0
- Fosson et al.: x Surger: 2.004, 0.0
- Sabharwal et al.: x Variable: 1.000, 0.0

- Note: All entries require the use of a Y-connector.

- Enrollment: Peritoneal dialysis
- Unpublished data from urgent PD pake.

Arramreddy, et al. AJKD 2014;63

- Does technique of placement of PD catheter matter?
  - Abstract #5026 “Percutaneous versus surgical insertion of PD catheters in dialysis patients: a meta-analysis”
  - Thirteen studies with a total of 2749 subjects met the inclusion criteria.
  - There was no significant difference in 1-year catheter survival in percutaneous vs surgical PD catheter placement (relative risk [RR]=0.81; 95% confidence interval [CI]: 0.59-1.11, p=0.13).
  - Catheter dysfunction also did not differ significantly between the groups (pooled odds ratio [OR]=0.86; 95% CI: 0.57-1.29, p=0.46) respectively.
  - The prevalence of peritoneal fluid leak also was similar for percutaneous and surgical groups (OR=1.10; 95% CI: 0.58-2.09, p=0.77).
  - However, there was a significant lower incidence of peritonitis among those with percutaneous placement (incidence rate ratio [IRR]=0.77; 95% CI: 0.62-0.96, p=0.02).
Peritonitis

Leak

Increase in PD Patients When Nephrologists Place Catheter

Asif et al, Seminars in Dialysis 18: 157, 2005

Our patient

- Started acute PD in the ICU
- Used 12hr cycling with 1.0L of 2.5% dextrose and last fill of 1.0L Icodextrin for 5 days
- BUN down 20 first day and continued decrement
- Positive UF of 3L first day, 4L second day with improvement in symptoms
- Gradual increase in fluid to 1.2L over next week and conversion to CCPD at night with 5 exchanges
- Patient discharged after 10 days on a Friday and scheduled for training at clinic Monday AM
- Currently doing well at home on transplant list