CARE OF THE RENAL TRANSPLANT PATIENT:
PERITONEAL DIALYSIS CONSIDERATIONS

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DISCLOSURES/CONFLICTS OF INTEREST:

- None.

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INTRODUCTION:

Implications of peritoneal dialysis as primary pre-transplant renal replacement (RRT) modality on:
- Mortality/Graft survival
- Delayed Graft Function (DGF)
- Post Transplant Diabetes Mellitus (PTDM)
- Allograft thrombosis

Peri-transplant implications of peritoneal dialysis on:
- Should the PD catheter be removed at time of transplant?
- Usage of PD vs HD for RRT during delayed graft failure

Implications of Peritoneal Dialysis for Dialysis after graft loss (DAGL) on:
- Outcomes: mortality/graft survival
- Role (if any) for percutaneous PD catheter insertion for DAGL

IMPLICATIONS OF PERITONEAL DIALYSIS AS PRE-TRANSPLANT RENAL REPLACEMENT (RRT) MODALITY ON MORTALITY AND GRAFT SURVIVAL/DGF:

Gordfarb-Rumyantzev et al. The Role of pre-transplantation renal replacement therapy on modality in kidney allograft and recipient survival. AJKD 2005 (USRDS cohort from Jan 1 1990- Dec 1999 (n-92,844))

- PD as the main pre-dialysis RRT pre-transplant predicts 3% lower graft failure. ($p < 0.05$)
- PD as the main pre-dialysis RRT pre-transplant predicts 6% lower mortality ($p<0.001$)
- (main pre-dialysis PD defined as > 50% of the time on PD)

Synder J et al. KI 2002: Compared effects of pre-transplant dialysis modality on allograft and patient survival in a large USRDS cohort from 1995-1998 (n=252,402)

- Kidney Transplant was 1.39 x more likely in PD patients ($p<0.0001$)
- Peritoneal dialysis had a lower incidence of delayed graft function
- Allograft thrombosis was slightly more common in PD patients (10% more)
- Overall death censored graft failure was 1.15 higher in PD patients ($p < 0.05$)
- Mortality and overall graft survival were no different in PD vs HD patients in patients whose grafts survived past 3 months.

IMPLICATIONS OF PERITONEAL DIALYSIS AS PRE-TRANSPLANT RENAL REPLACEMENT (RRT) MODALITY ON MORTALITY AND GRAFT SURVIVAL:

Schwenger V et al. NDT 2011: One of the Largest studies of pre-transplant dialysis modality: looked retrospectively at 60,008 renal allograft recipients. (Data from the International Collaborative Transplant Study) 1998-2007.

- 11,664 patients treated with PD as their primary pre-transplant RRT
- 45,651 patients treated with HD as their primary pre-transplant RRT
- HD and PD treated patients had similar death-censored renal allograft survival ($p=0.014$)
- PD patients had a 10% lower all-cause mortality- due to a significantly lower rate of cardiovascular disease.

Miklos et al. CJASN 2012: Dialysis Modality and Outcomes in Kidney Transplant Recipients
USRDS study of 12,416 HD transplant patients and 2092 PD transplant patients

- PD patients had lower (21.9/1000 pt years) crude all-cause mortality compared to HD
- Pre-transplant PD associated with 43% lower all-cause mortliaty and 66% lower CV death.
- PD patients had 17% lower unadjusted death-censored graft failure rate
- PD patients had a 36% lower incidence of delayed graft failure (DGF)
- After adjustment of co-variates/co-morbidities Pre-transplant peritopeal dialysis was not a significant predictor of death-censored graft failure.

IMPLICATIONS OF PERITONEAL DIALYSIS AS PRE-TRANSPLANT RENAL REPLACEMENT (RRT) MODALITY ON MORTALITY AND GRAFT SURVIVAL:

Renal allograft survival:

1. Long-term death censored renal allograft survival post-transplant generally equivalent between patients treated primarily with PD or HD pre-transplant.
2. Similar findings for cadaveric and live donor transplant graft survival

Mortality:

1. Some studies have found up to 10% lower all-cause mortality in patients treated pre-transplant primarily with PD. (but this was attributable mainly to higher prevalence of CV disease in incident HD patients).
2. Other studies have failed to show significant difference in post-transplant survival based on pre-transplant dialysis modality
3. Patients on PD have been found to undergo transplantation at a higher rate (approximately 40% more likely to undergo transplant)- Synder et al. (USRDS database analysis with adjustment for co-morbidities, vintage, BMI, GFR, etc…) KI, 2002.

IMPLICATIONS OF PERITONEAL DIALYSIS AS PRE-TRANSPLANT RENAL REPLACEMENT (RRT) MODALITY ON DELAYED GRAFT SURVIVAL:

- Delayed graft failure (DGF) is defined need for dialysis within 1 week post-transplant. Can be seen in up to 20% of transplants, (due to increased use of extended donor criteria kidneys/ High KDPI score kidneys).
  - DGF increases the risk of graft loss acutely to about 41%
  - Studies have shown a decreased rate of DGF in patients treated pre-transplant with PD as their primary dialysis modality:
    - This has been speculated to be due primarily to increased residual renal function
    - Older studies have shown that in Patients treated with HD using more "biocompatible" membranes had lower rate of DGF that HD patients treated with less biocompatible membranes. There is no dialysis membrane more biocompatible than the peritoneum

IMPLICATIONS OF PERITONEAL DIALYSIS AS PRE-TRANSPLANT RENAL REPLACEMENT (RRT) MODALITY ON GRAFT THROMBOSIS

- Patients treated pre-transplant with peritoneal dialysis as their primary dialysis modality have been shown to have a slightly higher risk of acute renal allograft thrombosis. (etiology is unclear) – due to hypoalbuminemia?
- Incidence (in adults) of acute renal allograft thrombosis is < 1% of cases
- Etiology of acute renal allograft thrombosis is primarily technical, i.e. Cold ischemic time and issues with the creation of the arterial and venous anastomoses, etc… therefore clinical relevance of pre-transplant PD as primary dialysis modality is likely negligible
- Patient's with nephrotic syndrome (at time of transplant) are at most risk for graft thrombosis due to associated hypercoalulable state. (this can be partially ameliorate by pre-transplant HD)
- No consensus on checking routine PD fluid culture/cell count pre-transplant, some centers routinely do this, others do not.

IMPLICATIONS OF PERITONEAL DIALYSIS AS PRE-TRANSPLANT RENAL REPLACEMENT (RRT) MODALITY ON POST TRANSPLANT DIABETES MELLITUS (PTDM)

- Patients treated pre-transplant with peritoneal dialysis as their primary dialysis modality have been shown in some studies to have an increased incidence of PTDM
- But other more recent studies have not corroborated this, more studies needed.
- In any case the additional risk is minimal if any.

PERITRANSPLANT ISSUES: SHOULD PD CATHETER BE REMOVED AT TIME OF RENAL TRANSPLANT

- Many transplant centers remove the PD catheter at time of transplant, some do not.
- Warren et. Al. (CUAJ 2012) 118/137 Transplant patients had PD catheters left at time of transplant. Of 15 pts requiring post-transplant PD: 33% had peritonitis and 20% had fluid leaks prompting HD. Overall risk of Peritonitis of leaving the PD catheter in was 7% vs 0% if removed.
- Given rather high incidence of complications from leaving the PD catheter in at time of transplant, most transplant centers tend to remove the PD catheter at time of transplant in the majority of cases.

PERITRANSPLANT ISSUES: USAGE OF PD VS HD FOR RENAL REPLACEMENT THERAPY IN THE SETTING OF DGF

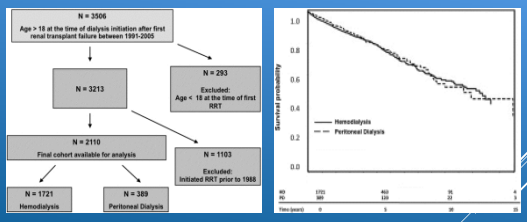
- Generally using PD to provide renal replacement therapy in the acute post-transplant setting for DGF is associated with a higher risk of complications and infection than using hemodialysis.
  - Thomson et al. (Clin Transplant 2013): Retrospective observational study at two Canadian transplant centers, compared DGF patients requiring RRT treated with PD (14 pts) vs HD (63 pts), equivalent baseline demographic factors/co-morbidities:
    - Wound infection/leak higher in PD (5/14) vs HD (6/63) p = 0.024
    - PD was associated with shorter length of hospitalization (13.7 vs 18.7 days p=0.043)
    - PD was associated with fewer days requiring dialysis post-operatively (6.5 days vs 11 days p=0.043)
    - Acute rejection epidoses, and readmission rates at 6 months were similar.
    - Graft survival did not differ at 1 year.

RETURNING TO DIALYSIS AFTER RENAL ALLOGRAFT FAILURE (DAGL):

- Yang KS et al. Transplant Proc 2013: Compared 47 DAGL patients started on PD vs 668 transplant naïve patients started on PD: Clinical Outcomes of PD in DAGL patients were comparable with those of transplant naïve patients at 1,5,10 years. No significant change in Mortality, or technique failure/issues.
- Chen A et al. CJASN 2012: Children starting PD after renal allograft failure had a very slight increase in peritonitis rats compared to transplant naïve patients.
- Other studies have shown a slightly increased in infection (peritonitis and exit site) in DAGL patients treated with PD vs transplant naïve patients, especially on those on long-term steroids.

RETURNING TO DIALYSIS AFTER RENAL ALLOGRAFT FAILURE (DAGL):

4. Perl J et al. CJASN 2011: Use of PD compared to HD after DAGL revealed similar early and overall long-term patient survival.



RETURNING TO DIALYSIS AFTER RENAL ALLOGRAFT FAILURE (DAGL):

1. Peritoneal Dialysis remains a viable treatment modality for renal replacement therapy after renal allograft failure.

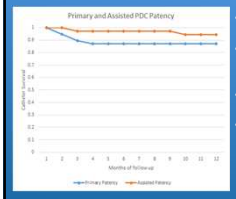
RETURNING TO DIALYSIS AFTER RENAL ALLOGRAFT FAILURE (DAGL): LAPAROSCOPIC VS PERCUTANEOUS PLACEMENT OF PERITONEAL DIALYSIS CATHETERS

1. Not much data specifically comparing laparoscopic vs percutaneous PD catheter insertion in the post-transplant setting.
2. Many studies comparing laparoscopic and percutaneous PD catheter insertion, that demonstrate generally equivalent outcomes
3. Most studies comparing laparoscopic and percutaneously placed PD catheters exclude patients with prior surgery. But a few studies on percutaneous PD catheter placement compared to laparoscopic that did include patients with prior abdominal surgeries also show equivalent results in terms of catheter patency.

RETURNING TO DIALYSIS AFTER RENAL ALLOGRAFT FAILURE (DAGL): LAPAROSCOPIC VS PERCUTANEOUS PLACEMENT OF PERITONEAL DIALYSIS CATHETERS

1. In our experience with 100 pts with 1 year of f/u data of percutaneous fluoroscopic peritoneal dialysis catheter insertion:
   1. Ave Age: 58 +/- 17
   2. Obese with BMI > 30 43%
   3. Prior abdominal surgery 43% (15pts had prior transplant as one or only prior surgery)
   4. Diabetes 54%

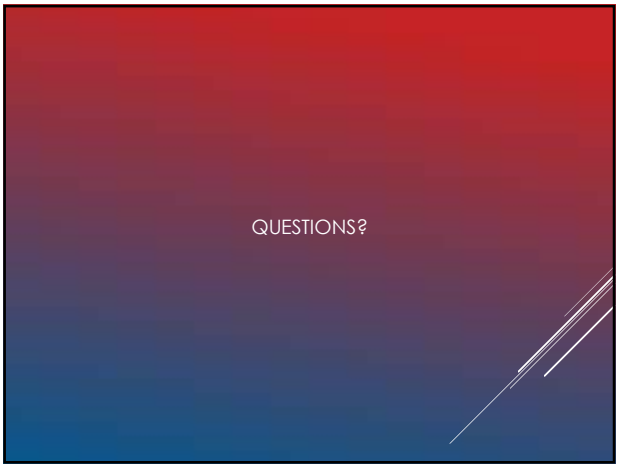
RETURNING TO DIALYSIS AFTER RENAL ALLOGRAFT FAILURE (DAGL): LAPAROSCOPIC VS PERCUTANEOUS PLACEMENT OF PERITONEAL DIALYSIS CATHETERS



- Primary PD catheter patency (unassisted) 87% at 12 months
- Secondary PD catheter patency (allowing for fluoroscopic catheter salvage only) 94% at 12 months.
- No change seen in catheter patency between patients with prior abdominal surgery and not.
- This compares favorably with reported outcomes with laparoscopic PD catheter placement

SUMMARY:

1. Peritoneal dialysis remains a reasonable renal replacement modality for patients awaiting renal transplantation, with comparable allograft and patient survival when compared to patients treated with hemodialysis. Peritoneal dialysis patients are more likely to be transplanted than HD
2. Peritoneal dialysis catheters should probably be removed at time of renal transplantation in the majority of patients
3. Hemodialysis is probably a more practical choice to provide dialysis immediately post transplant for delayed graft failure
4. Nephrotic patients should probably undergo hemodialysis immediately pre-transplantation to minimize the risk for allograft thrombosis/VTE.
5. Peritoneal dialysis remains a viable treatment modality for renal replacement therapy after renal allograft failure. (DAGL)
6. Percutaneous Peritoneal Dialysis catheter placement has equivalent outcomes to laparoscopically placed catheters and remains a viable option for patient's wanting to do peritoneal dialysis after allograft failure (DAGL).


QUESTIONS?