

Peritoneal Dialysis VS Hemodialysis

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Introduction

An increasing incidence of end-stage renal disease (ESRD) has caused a substantial increase in the number of patients requiring renal replacement therapy (RRT).

Hemodialysis (HD) and peritoneal dialysis (PD) are two common forms of dialysis therapy for ESRD.

Whether there exists a survival advantage for either HD or PD has been an area of intense interest and controversy over the past few years.

Introduction

The choice between PD and HD has remained a subject of debate.

However, the balance is swinging in favor of PD because of several advantages associated with the utilization of PD in comparison to HD.

Contraindication of HD

Absolute contraindication: the inability to secure vascular access.

Relative contraindications:

Difficult vascular access

Needle phobia

Cardiac failure

Coagulopathy

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Hemodialysis - StatPearls - NCBI Bookshelf

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Hemodialysis

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Strong Indications for PD

Obligate situations such as vascular access failure and intolerance to hemodialysis (HD);

Medical preferences such as congestive heart failure, prosthetic valvular disease, and children aged 0-5 years;

Social situations such as patient preference and living far from an in-center dialysis unit.

Article

Peritoneal dialysis: Its indications and contraindications

February 2000 · Dialysis & Transplantation 29(2):71-77

February 2000 · 29(2):71-77

Authors:



A. Shetty



D.G. Oreopoulos

The situations where PD is preferred

Bleeding diathesis,

Multiple myeloma,

Labile diabetes,

Chronic infections,

Possibility of transplantation in the near future,

Age between 6 and 16 years,

Needle anxiety,

Active lifestyle.

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Situations where PD is not preferred but possible with some special considerations

Obesity,

Multiple hernias,

Severe backache,

Multiple abdominal surgeries,

Impaired manual dexterity,

Blindness,

Less-than-ideal home situation,

Depression.

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Relative contraindications for PD

Patients with severe malnutrition,

Multiple abdominal adhesions,

Ostomies,

Proteinuria >10 g/day,

Advanced COPD,

Presence of a Le Veen or ventriculo-peritoneal shunt,

Upper limb amputation with no help at home,

Poor hygiene,

Dementia,

Those who are homeless.

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Contraindication of PD

Documented Type II ultrafiltration failure,

Severe inflammatory bowel disease,

Active acute diverticulitis,

Abdominal abscess,

Active ischemic bowel disease,

Severe active psychotic disorder,

Marked intellectual disability,

In women starting dialysis in the third trimester of pregnancy.

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Authors:



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Effect of starting with hemodialysis compared with peritoneal dialysis in patients new on dialysis treatment: A randomized controlled trial

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Methods. All new dialysis patients from 38 dialysis centers in The Netherlands without indications against either modality were invited to participate. Patients were assigned to start with hemodialysis or peritoneal dialysis. The primary outcome was mean quality-adjusted life year (QALY) score. Secondary outcome was survival.

Results. Due to the low inclusion rate, the trial was prematurely stopped after which 38 patients had been randomized: 18 patients to hemodialysis and 20 to peritoneal dialysis. The mean QALY score in the first 2 years was 59.1 (SD 12) for hemodialysis patients versus 54.0 (SD 19) for peritoneal dialysis patients, which constitutes a small difference in favor of hemodialysis of 5.1 (95%CI -7.3 to 17.6) After 5 years of follow-up, nine hemodialysis and five peritoneal dialysis patients had died, a significant difference in survival; hazard ratio of hemodialysis versus peritoneal dialysis of 3.8 (95%CI 1.1 to 12.6). After adjustment for age, comorbidity, and primary kidney disease the hazard ratio was 3.6 (0.8 to 15.4).

Conclusion. Only a small difference in QALY score was observed between patients who started with hemodialysis compared to patients who started with peritoneal dialysis, lending support for the equivalence hypothesis. The significant difference in longer-term survival, which favored peritoneal dialysis in this small group of patients, could be used to posit that incident dialysis patients might benefit from starting on peritoneal dialysis.

RESEARCH

Open Access



Impact of initial dialysis modality on the survival of patients with ESRD: a propensity-score-matched study

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Background Studies comparing the survival of hemodialysis (HD) and peritoneal dialysis (PD) patients are controversial. This study evaluated the impact of initial dialysis modality on the survival of patients with end-stage renal disease (ESRD) in a matched-pair cohort.

Methods A retrospective cohort study was performed on ESRD patients who initiated renal replacement treatment between January 1, 2010, and December 31, 2018. Propensity score matching was applied to balance the baseline conditions, and multivariate Cox regression analysis was applied to compare mortality between HD and PD patients and evaluate correlations between mortality and various baseline characteristics. Subgroup analysis was performed with respect to diabetes status.

Results There were 739 patients in our center in the Chinese National Renal Data System (CNRDS) between 2010 and 2018. Of these, 125 PD patients were matched with 125 HD patients. The 1-, 2-, and 3-year survival rates were 96.5%, 90.7%, and 82.5%, respectively, in the HD group and 99.5%, 97.8%, and 92.5%, respectively, in the PD group (log-rank $P < 0.001$). Among the propensity score-matched cohorts, no significant differences in Kaplan–Meier curves were observed between the two groups (log-rank $P = 0.514$). Age at dialysis initiation, CCI, congestive heart failure and cerebrovascular disease were risk factors in the multivariable-adjusted model. In subgroups defined by diabetes status, the Kaplan–Meier survival curve showed that PD survival was significantly higher than that of HD (log-rank $P = 0.022$).

Conclusions HD and PD were not significantly different regarding the survival of patients with ESRD. PD was associated with better survival in diabetic ESRD patients.

Peritoneal Dialysis Versus Hemodialysis: Risks, Benefits, and Access Issues

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Risks and Benefits of PD Versus HD

Integrated care models of chronic kidney disease (CKD) and end-stage renal disease (ESRD) emphasize transitions between treatment modalities (hemodialysis [HD], peritoneal dialysis [PD], and kidney transplantation) and the possibility that a specific patient will, in his or her lifetime with CKD/ESRD, experience more than one of these modalities.

Risks and Benefits of PD Versus HD

In general, when patients are required to be seen regularly before dialysis and educated about PD, up to 45% of patients choose PD.

Distance from an HD center is a primary factor in the choice of PD, accounting for 25% of the variability of dialysis modality choice in a 1996 to 1997 study of 3793 incident dialysis patients.

Risks and Benefits of PD Versus HD

Younger, white, employed, more educated patients in this study were likely to choose PD over in-center HD.

Because patient survival and acceptable quality of life are the ultimate goals of renal replacement therapies, it is important to compare mortality and morbidity in patients on PD and HD.

Risks and Benefits of PD Versus HD

More recent studies have described improved survival in PD patients, especially in the first 1 to 2 years of ESRD.

After 1.5 to 2 years on dialysis, the risk of death in PD patients becomes equivalent to or greater than that in HD patients, depending on patient factors such as age, diabetes, and other comorbidities.

Two recent studies showed the negative effects of central venous catheter (CVC) on patient survival.

Heaf JG, Lokkegaard H, Madsen M. Initial survival advantage of peritoneal dialysis relative to hemodialysis. *Nephrol Dial Transplant*. 2002;17:112-117.

Weinhandl ED, Foley RN, Gilbertson DT, et al. Propensity-matched mortality comparison of incident hemodialysis and peritoneal dialysis patients. *J Am Soc Nephrol*. 2010;21:499-506.

Risks and Benefits of PD Versus HD

Perl and colleagues demonstrated similar survival in PD and HD patients who began with an arteriovenous fistula (AVF) or arteriovenous graft (AVG) (90-day survival: 7.4% for PD and 6.1% for HDAVF/AVG), but significantly worse survival for HD patients beginning dialysis with a CVC (15.6% survival).

Perl J, Wald R, McFarlane P, et al. Hemodialysis vascular access modifies the association between dialysis modality and survival. *Clin J Am Soc Nephrol.* 2011;22:1113-1121.

Table 1. Risks and Benefits of PD and HD

	Benefits	Risks
PD	<ul style="list-style-type: none"> Survival years 1–2 Patient autonomy Patient satisfaction Maintenance of RRF Less delayed graft function post transplant Lower cost 	<ul style="list-style-type: none"> High technique failure (membrane failure, infection) Weight gain Patient and caregiver burnout
HD	<ul style="list-style-type: none"> Less patient responsibility Community/socialization 	<ul style="list-style-type: none"> Infection (bacteremia, sepsis) Access complications Higher mortality in the period just before and 12 hours after treatment, possibly due to electrolyte issues

Abbreviation: RRF, residual renal function.

Patient Satisfaction in PD and HD

Although there are few studies examining dialysis patients' satisfaction, PD patients usually report higher satisfaction than in-center HD patients.

Explanations for this may relate to the patients themselves and their perceived quality of life and independence (generally higher among PD patients) but may also reflect inherent qualities in patients that lead them to choose a home-based modality.

Rubin HR, Fink NE, Plantinga LC, et al. Patient ratings of dialysis care with peritoneal dialysis vs hemodialysis. *JAMA*. 2004;291:697-703.

Fadem SZ, Walker DR, Abbott G, et al. Satisfaction with renal replacement therapy and education: the American Association of Kidney Patients survey. *Clin J Am Soc Nephrol*. 2011;6:605-612.

Patient Satisfaction in PD and HD

Interestingly, PD patients are also more satisfied with their medical care providers (nurse and physician) despite less direct exposure to nephrologists than that experienced by in-center HD patients who are commonly seen weekly.

The availability of the PD nurse and the close relationship that often develops between PD nurses and their patients may foster patient confidence and support in a way that leads to more satisfaction than that experienced by in-center HD patients.

RESEARCH ARTICLE

Outcomes of peritoneal dialysis in elderly vs non-elderly patients: A systemic review and meta-analysis

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Objectives

Several studies have compared outcomes of peritoneal dialysis (PD) between elderly and non-elderly patients but with variable results. We hereby designed this review to compare mortality, peritonitis, and technique survival between elderly and non-elderly patients on PD.

Methods

PubMed, Embase, and Google Scholar were searched for studies comparing outcomes of PD between elderly and non-elderly patients. The last search date was 14th July 2021.

Results


Fourteen studies were included. 12 studies defined the elderly as ≥ 65 years of age and these were included in the meta-analysis. Pooled analysis of crude (RR: 2.45 95% CI: 1.36, 4.40 $I^2 = 97\%$ $p = 0.003$) and adjusted data (HR: 2.80 95% CI: 2.45, 3.09 $I^2 = 0\%$ $p < 0.00001$) indicated a statistically significant increased risk of mortality amongst elderly patients as compared to non-elderly patients. Meta-analysis of four studies demonstrated a statistically significant increased risk of peritonitis in the elderly (RR: 1.56 95% CI: 1.18, 2.07 $I^2 = 76\%$ $p = 0.002$). Pooled analysis demonstrated no statistically significant difference in technique survival between the two groups (RR: 0.95 95% CI: 0.86, 1.05 $I^2 = 86\%$ $p = 0.32$).

REVIEW

Open Access

Comparisons of quality of life between patients underwent peritoneal dialysis and hemodialysis: a systematic review and meta-analysis



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Objective: End-stage renal disease (ESRD) leads to renal replacement therapy and certainly has an impact on patients' health-related quality of life (HRQoL). This study aimed to review and compare the HRQoL between peritoneal dialysis (PD) and hemodialysis (HD) patients using the 36-Item Short Form Health Survey (SF-36), EuroQoL-5-dimension (EQ-5D) and the Kidney Disease Quality of Life Instrument (KDQOL).

Methodology: Systematic review was conducted by identify relevant studies through MEDLINE and SCOPUS up to April 2017. Studies were eligible with following criteria: studied in ESRD patients, compare any pair of renal replacement modalities, and reported HRQoL. The unstandardized mean differences (USMD) of HRQoL among modalities were calculated and pooled using a random-effect models if heterogeneity was present, otherwise a fixed-effect model was applied.

Results: A total of twenty-one studies were included with 29,000 participants. Of them, mean age and percent male were 48.1 years and 45.1, respectively. The pooled USMD (95% CI) of SF-36 between PD and HD (base) were 1.86 (0.47, 3.24) and 0.42 (– 1.99, 2.82) for mental component and physical component summary scores, respectively. For EQ-5D, the pooled USMD of utility and visual analogue scale (VAS) score were 0.02 (– 0.06, 0.10) and 3.56 (1.73, 5.39), respectively. The pooled USMD of KDQOL were 9.67 (5.67, 13.68), 6.71 (– 5.92, 19.32) 6.30 (– 0.41, 12.18), 2.35 (– 4.35, 9.04), 2.10 (0.07, 4.13), and 1.21 (– 2.98, 5.40) for burden of kidney disease, work status, effects of kidney disease, quality of social interaction, symptoms, and cognitive function.

Conclusion

This study showed patients with chronic kidney disease (CKD) stage 5 or ESRD treated with PD had better overall HRQoL than HD patients by using SF-36, EQ-5D and KDQOL self-report tools and had significantly moderately better in subdomain of physical functioning, role limitation due to emotional problem, effects and burden of kidney disease. Future studies should explore the trend of differences over time and the association to clinical outcome such as hospitalization and mortality.

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ORIGINAL RESEARCH

Brain and Behavior
Open Access

WILEY

Differences of connectivity between ESRD patients with PD and HD

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Objectives: The aim of this study was to investigate alterations in structural and functional brain connectivity between patients with end-stage renal disease (ESRD) who were undergoing peritoneal dialysis (PD) and hemodialysis (HD).

Methods: We enrolled 40 patients with ESRD who were undergoing PD (20 patients) and HD (20 patients). We also enrolled healthy participants as a control group. All of the subjects underwent diffusion tensor imaging (DTI) and resting-state functional magnetic resonance imaging (rs-fMRI). Using data from the structural and functional connectivity matrix based on DTI and rs-fMRI, we calculated several network measures using graph theoretical analysis.

Results: The measures of global structural connectivity were significantly different between the patients with ESRD who were undergoing PD and healthy subjects. The global efficiency and local efficiency in the patients with PD were significantly decreased compared with those in healthy participants. However, all of the measures of global structural connectivity in the patients with HD were not different from those in healthy participants. Conversely, in the global functional connectivity, the characteristic path length was significantly increased and the small-worldness index was decreased in patients with HD. However, the measures of the global functional connectivity in the patients with PD were not different from those in healthy subjects.

CONCLUSION

This study demonstrated that there were differences in alterations in structural and functional brain connectivity between patients with ESRD who were undergoing PD and HD and healthy participants. In addition, the language and verbal memory of patients who were undergoing HD were more impaired than those of patients who were undergoing PD. These findings suggest that brain connectivity and networks may be affected by different types of renal replacement therapy.



Original Investigation | Nephrology

Association Between Pretransplant Dialysis Modality and Kidney Transplant Outcomes

A Systematic Review and Meta-analysis

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IMPORTANCE The benefits and disadvantages of different pretransplant dialysis modalities and their posttransplant outcomes remain unclear in contemporary kidney transplant care.

OBJECTIVE To summarize the available evidence of the association of different pretransplant dialysis modalities, including hemodialysis and peritoneal dialysis (PD), with posttransplant outcomes.

DATA SOURCES MEDLINE, Embase, PubMed, Cochrane Library, Scopus, CINAHL, and gray literature were searched from inception to March 18, 2022 (updated to April 1, 2022), for relevant studies and with no language restrictions.

STUDY SELECTION Randomized clinical trials and nonrandomized observational (case-control and cohort) studies that investigated the association between pretransplant dialysis modality and posttransplant outcomes regardless of age or donor sources (living or deceased) were abstracted independently by 2 reviewers.

MAIN OUTCOMES AND MEASURES Primary outcomes included all-cause mortality, overall graft failure, death-censored graft failure, and delayed graft function. Secondary outcomes included acute rejection, graft vessel thrombosis, oliguria, de novo heart failure, and new-onset diabetes after transplant.

RESULTS The study analyzed 26 nonrandomized studies (1 case-control and 25 cohort), including 269 715 patients (mean recipient age range, 14.5-67.0 years; reported proportions of female individuals, 29.4%-66.9%) whose outcomes associated with pretransplant hemodialysis vs pretransplant PD were compared. No significant difference, with very low certainty of evidence, was observed between pretransplant PD and all-cause mortality (13 studies; $n = 221\,815$; HR, 0.92 [95% CI, 0.84-1.01]; $P = .08$) as well as death-censored graft failure (5 studies; $n = 96\,439$; HR, 0.98 [95% CI, 0.85-1.14]; $P = .81$). However, pretransplant PD was associated with a lower risk for overall graft failure (10 studies; $n = 209\,287$; HR, 0.96 [95% CI, 0.92-0.99]; $P = .02$; very low certainty of evidence) and delayed graft function (6 studies; $n = 47\,118$; odds ratio, 0.73 [95% CI, 0.70-0.76]; $P < .001$; low certainty of evidence). Secondary outcomes were inconclusive due to few studies with available data.

CONCLUSIONS AND RELEVANCE Results of the study suggest that pretransplant PD is a preferred dialysis modality option during the transition to kidney transplant. Future studies are warranted to address shared decision-making between health care professionals, patients, and caregivers as well as patient preferences.

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Original Paper

Hemodialysis or Peritoneal Dialysis, Which Is Better for Patients with Delayed Graft Function?

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1403.04.14
PD VS HD

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Background/Aims

Hemodialysis (HD) or peritoneal dialysis (PD) is an important renal replacement method in patients with delayed graft function (DGF) after kidney transplantation; however, it is not clear which dialysis modality is superior.

This study determined the impact of different dialysis modalities on patients with DGF.

Methods

It was a single-center, retrospective and descriptive study. We performed 673 kidney transplants from donors after cardiac death (DCD) between January 2010 and December 2016 at our center and 138 (20.5%) recipients developed DGF after transplantation.

We classified the recipients into two groups according to post-transplant dialysis: DGF-HD (n=96) and DGF-PD (n=42).

We analyzed the outcomes of the different dialysis modalities 30 days and 1 year post-transplantation.

Results

There were no differences in baseline factors between patients with post-transplant HD (n = 96) or PD (n = 42).

There were 10 patients with conversion from PD to HD during DGF.

The DGF-PD patients had a higher rate of treatment failure than the DGF-HD patients (23.8% vs. 0%, $p < 0.001$), peritonitis (7.1% vs. 0%, $p = 0.027$), and longer duration of dialysis dependence (10.5 vs. 9 days, $p = 0.003$).

There was no statistically significant difference between both groups with respect to acute rejection, hemorrhage, and patient and graft survival at 1 year.

Conclusion:

In renal transplant recipients with DGF, post-transplantation PD led to increased treatment failure.

PD did not exhibit the advantage of rapid recovery of transplanted renal function, but PD had a high probability of peritonitis.

DGF-PD patients should be converted to HD in a timely fashion when complication arises.

Final Word

The advantages of PD over HD have been well recognised. It is imperative that the institutions providing care to the kidney failure patients should revisit their dialysis patients and programmes and follow a pathway that is in the best interest of their kidney failure patients. Expansion of existing PD programme through training and education of the patients, medical and surgical team, development of local clinical practice guidelines, maintenance of a registry, regular audit of clinical outcomes and integration of the available resources will help towards effective delivery of PD service.⁸

