Dialysis in diabetic patient

Dr Dolatkhany nephrologist

- Incidence of ESRD in DM patients is 10-fold higher compared to nondiabetic subjects .

- diabetes mellitus is independently associated with the risk of developing hypertension, cerebrovascular accidents, and congestive heart failure in dialysis patients.

Timing of start of dialysis in diabetes mellitus patients: a systematic literature review*

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- in systematic review, including 11 studies for a total of 581 445 patients with diabetes in which a comparison between early and late start was made, found conflicting results with regard to the benefit of early or late start of dialysis in patients with diabetes and advanced CKD ,patients with an eGFR of 10–15 mL/min, comparing start at eGFR of ~ 10 versus ~ 5–7 mL/min/1.73.

- Conclusions: There is no difference between early (eGFR) and late (lower eGFR) start of RRT with regard to mortality in patients with diabetes.

- RRT should thus be initiated based on the same criteria in all patients, irrespective of the presence or absence of diabetes.

RESEARCH Open Access

Comparison of peritoneal dialysis and hemodialysis as first renal replacement therapy in patients with end-stage renal disease and diabetes: a systematic review

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Potential Benefits of Peritoneal Dialysis in Diabetics

- Even before the dialysis stage, most diabetic patients with ESRD have multiple cardiovascular and metabolic complications. Because of the rapid and intermittent removal of solutes and water and the extracorporeal circulation inherent to HD, it can frequently be associated with dialysis-induced hypotension, coronary ischemia, and arrhythmia , possibly leading to a worsening cardiovascular status in thes patients PD avoids aggressive fluid shifts offering a better hemodynamic tolerance.

- RRF(residual renal function) is a strong predictor of patient survival and is preserved better among patients receiving PD than in those receiving HD , Moist et al. showed that the risk of RRF loss was 65% lower in PD patients than in HD .

- Among patients undergoing PD, the rate of RRF loss is higher in diabetic than in non-diabetic patients (Diabetes is also a risk factor for faster RRF decline),Interestingly, fluid overload and impaired RRF are closely linked, Udo et al ,reported that diabetic patients electively starting PD showed greater extracellular water retention 6–10 weeks after starting PD than did non-diabetic patients, despite similar peritoneal function, as determined by the peritoneal equilibration test.

- Fewer episodes of progressive diabetic retinopathy were observed in the PD patients, also fewer events of hemorrhagic retinopathy, and this is probably related to a more stable hemodynamic status and a lack of exposure to heparin.

- Concerning insulin therapy, the advantages of intraperitoneal insulin administration include a higher physiological effect of insulin in patients with diabetic nephropathy during continuous ambulatory PD (CAPD) or automated PD (APD) treatment.
  Major fluctuations of blood glucose,hyperinsulinemia, and the formation of insulin antibodies can be minimized. In the final analysis, a better adjustment of blood glucose levels results.

Table 1: Potential benefits and risks of PD in the treatment of diabetic patients.

General PD benefits	Specific PD benefits in diabetics	PD risks in diabetics
(1) Home-based continuous therapy	(1) Sustained daily ultrafiltration	(1) Fluid overload
(2) Advantages in lifestyle	(2) Better preservation of residual renal function	(2) Aggravated dysregulated metabolic response to glucose
(3) Avoids vascular access related infections	(3) Vascular capital preservation	(3) Hyperinsulinemia
(4) Avoids recurrent circulatory stress	(4) Avoids peripheral and coronary steal syndromes	(4) Central obesity
(5) Avoids myocardial stunning	(5) Fewer episodes of hypotension	(5) Dyslipidemia
(6) Fewer episodes of blood-borne disease	(6) Better blood pressure control	(6) Peritoneal albumin losses
(7) More liberal diet (in spite of fluid and Na restriction)	(7) No need for systemic anticoagulation	(7) Peritoneal infection
(8) Control of anemia with lower doses of erythropoietin	(8) Fewer episodes of progressive retinopathy	(8) Membrane fast transport status
(9) Lack of pain from needle puncture	(9) Feasibility of elective intraperitoneal insulin	
(10) Lower rate of delayed renal graft function		

The risk of death tended to be higher among diabetic patients with ESRD receiving incident PD as RRT than among those receiving incident HD.

However, we could not determine definitively whether PD or HD was superior with regard to patient outcomes because of the high risk of bias and the diversity of management of diabetic patients under going dialysis.

Therapeutic Apheresis and Dialysis

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Review

New-Onset Diabetes Mellitus in Peritoneal Dialysis and Hemodialysis Patients: Frequency, Risk Factors, and Prognosis—A Review

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- result revealed that patients undergoing dialysis with pre-existing diabetes had a 32 % higher mortality rate than NDD patients,and patients with new-onset diabetes after dialysis also had a 44 % increased death risk.

- the prevalence of new-onset diabetes after dialysis was around 12.7 % within a ten-year follow-up period.

- NODM and DM both are based on plasma glucose (PG) criteria and defined either as fasting PG (FPG) ≥ 7.0 mmol/L or 2-h PG > 11.1 mmol/L in the oral glucose tolerance test (OGTT).

- (ADA) defined an Hb A1c threshold of ≥ 6.5% as the third criterion for diagnosis of DM and NODM.

- Glucose has a small molecular size of 180 Da.
  Therefore, it is quickly absorbed across the peritoneum and metabolized after entering the blood circulation.
- Glucose-free dialysate is rarely used in HD patients because of increased risk of hypoglycemia,While glucose is one of the components of hemodialysates, glucose load in HD is far less than in PD patients.

- new-onset hyperglycemia is observed in approximately 25% of incident PD patients even when treated with three exchanges with 1.5% glucose concentration per day, which resembles a low daily glucose exposure .

- data about the effect of glucose load on the risk of NODM remain controversial.

risk factors for NODM in dialysis:

- female sex
- higher age
- cardiovascular diseases (CVDs)
- hypertension
- chronic obstructive pulmonary disease

DIFFERENCES IN NODM FREQUENCY BETWEEN PD AND HD PATIENTS

- Some studies reported a lower incidence or prevalence of NODM in PD vs. HD . In the study by Woodward et al., the incidence of NODM in dialysis patients was 10.7% and 12.7% in PD patients and HD patients, respectively.

- Chouet al. showed a NODM incidence of 2.4 % years in PD patients and 3.7 % years in HD patients, respectively.

- But the authors concluded that dialysis modality was not a risk factor for development of NODM .

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Cardiovascular Diabetology

ORIGINAL INVESTIGATION

Open Access

Effect of anti-diabetic drugs in dialysis patients with diabetes: a nationwide retrospective cohort study

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- According to the Kidney Disease Outcomes Quality Initiative (KDOQI) guideline, only several oral hypoglycemic agents (OHA) kinds can be administered in dialysis patients,including :

- sulfonylurea (SU, such as glipizide and gliclazide)
- meglitinide (repaglinide)
- thiazolidinediones (TZD)
- dipeptidyl-peptidase IV (DPP-4) inhibitors.

- analysis also showed that patients using SU, meglitinide, TZD, DPP-4 inhibitor, or insulin all had significantly better outcomes compared with non-users.

- use of DPP-4 inhibitors appears to be more reasonable and valuable. Compatible with our finding, Chan et al,indicated that DPP-4 inhibitor users in diabetic dialysis patients had a lower risk of all-cause mortality than nonuser.

- The survival benefits may be attributable to significantly fewer ischemic stroke events among DPP-4 inhibitor users due to neuroprotective effects.
- DPP-4 inhibitors have a greater reduction in HbA1C than in fasting blood sugar, which can lower the possible side effect of hypoglycemia and reduce blood glucose variability .
- DPP-4 inhibitors resulted in fewer weight gain side effects, more protective of pancreatic beta-cell function and volume, and better tolerability.

- the HbA1C level strongly predicted mortality in hemodialysis patients with type 1 or type 2 diabetes.

- Few diabetic patients may experience spontaneous resolution of hyperglycemia status and fluctuating HbA1C levels to as low as < 6 % after entering dialysis. Some experts defined this phenomenon as “burn-out diabetes”.

- Multiple factors may contribute to this condition, including malnutrition, protein-energy wasting,prolongation of insulin half-life due to decreased clearance, reduction of renal gluconeogenesis, accumulation of uremic toxin, and glucose removal by hemodialysis.

Diabetic Renal Diet: What is Left to Eat?

Salt

- Salt reduction : Sodium Chloride
  - <2 -3 g per day or 80-100mmol/day
  - Mainly in processed food

- Potassium Chloride – salt substitute
  - Beneficial to pts with hypertension but not for individual with hyperkalemia

Protein

- Without dialysis:

- CKD stage 3-5: 0.8 to 0.9g protein/kg IBW /day

- Nephrotic syndrome:

  0.8 –1.0g/kg/day (KDIGO 2012)

- With dialysis:

- Haemodialysis :>1.1g/kg/d

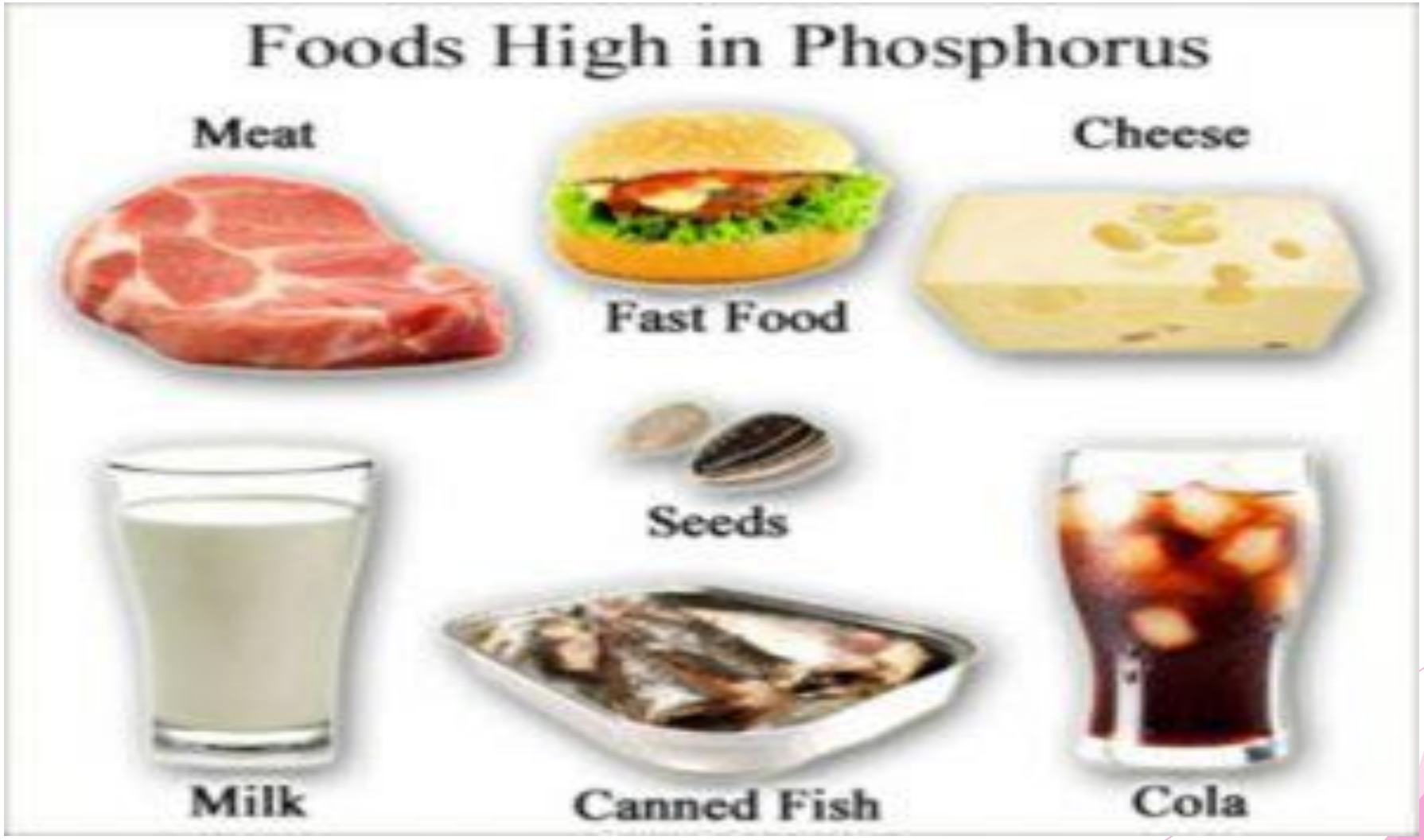
- Peritoneal Dialysis: >1.2g/kg/d

potassium

- Low Potassium Diet
- Choose high fibre content

- Cooking method
  - Boiling food is the best method
  - Taking 60-80% of potassium content

phosphore


Foods High in Phosphorus
Meat
Fast Food
Cheese
Seeds
Milk
Canned Fish
Cola

Kidney Disease Diet

Eat foods low in sodium

Avoid canned, packaged, and frozen foods

Limit potassium intake and foods high in phosphorus

Lowering protein intake may be recommended

Limit fluids in advanced kidney disease

thanks