Peritoneal dialysis in diabetic patient

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ESRD

- Diabetes is major risk for ESRD
- Involving considerable human and financial resources.

Incidence

- The proportion of new patients starting renal replacement therapies whose ESRD was caused by diabetes increased from 27%to 44.4%.in USA

- Diabetes is the fastest growing cause of ESRD.

Clinical course

- Data from monitoring more than 5000 patients in UKPDS study allow us to establish the clinical course of of nephropathy in type 2 DM .

- It takes 19 years to develop the disease, 11 years from microalbuminuria to macroalbuminuria and decline renal function starts

- Cr>2mg/dL were undergoing RRT in just 2 1/2 years.

Start PD

- Early nephrology referral
- Patient education and multidisciplinary support are recommended
- Patient and family education before stating RRT is essential in decision making.

Pd first

- PD first sparing their vascular capital and preserving residual renal function.

Family factor for making decision

- Fear of infection
- Daily commitment to PD
- Pre dialysis education
- Knowledge about different type and RRT
- Opportunity for contact with center.

Better outcome

- Double bag system
- Non glucose solution
- Better education for patients and their family

Study in 5 country

- Pd seems to be a good starting technique for RRT in patients with DM and has certain advantage especially in first two years
- Key factors such as comorbidity, social situation, and above all patients preference should be a starting point for RRT.

Benefits compare to HD

- Rapid and intermittent removal of solutes and water and extra corporal circulation inherent to HD can be induced hypotension, coronary ischemia,and arrhythmia possibly leading to a worsening cardiovascular stability in these patients.

PD benefit

- PD avoids aggressive fluid shifts offering a better hemodynamics tolerance

PD benefits

- In CHF ritual can worsen the cardiovascular situation, in PD there is no need to vascular access.so reduce load of heart.

Unplanned dialysis

- PD as an option for unplanned dialysis initiation in ESRD
- Time for starting is less than two weeks and can be started immediately in urgency.

Late referral

- Compare the short term complicity and long term prognosis between PD and HD:
- Dialysis related complications required 30 days was significantly lower in PD patients but urgent HD had much more complications
- PD sep 2018

Endotoxemia

- In HD regional ischemia from hypotension may lead to increase endotoxins translocation from the gut

- Resultant endotoxinemia is associated with systemic inflammations marker of malnutrition, cardiovascular injury and reduced survival .

- Circulatory endotoxinemia was most notably documented in those patients with highest CVD and sharp increase of endotoxin was observed after initiation of HD.

Residual renal function

- RRF is an important matter in survival of Pd and HD patients.
- In diabetes it decrease faster
- In Pd it is preserved much better.

Progressive of diabetic retinopathy

- Progressive of retinopathy is lesser in PD as the hemodynamics stability and no use of heparin.

Japanese study

- They compare Pd patients and HD for one year and showed no worsening of retinopathy in PD while in HD patients 20% increase in retinopathy.

Insulin intra peritoneal

- Using insulin IP can control the blood glucose much better and no antibody formation but increase the risk of peritonitis.
- IP insulin can induce hepatic sub capsular steatosis.

Peritonitis

- Global peritonitis rate are similar between non diabetic and diabetic but the complications are worse in diabetic person.

Lower use of EPO

- EPO needs much lower than HD
- Lower risk of blood born disease like HCV

HbA1C

- HbA1C may not be show as true value with same average glucose compare to patients not using EPO, so HbA1C underestimating the glucose level secondary to use of EPOmeaning larger proportion of circulating erythrocytes have not been around for glcosylation.

Icodextrin

- With use of icodextrin problems of PD in diabetic ESRD reduce so much.
- A better survival of peritoneal membrane due to lower GDP
- Better removal of fluids
- Icodextrin metabolites interference with capillary blood glucose measurement. May be a hypoglycemic coma can't be diagnosed.

Icodextrin a study

- There are still controversies whether peritoneal dialysis(PD) with icodextrin preserves residual renal and peritoneal function in diabetic.

- The technique survival rate was 71.4% in ico and 45% in glucose, most technique failure was due to volume overload.
- RRF decline more faster on ico groups but not significantly.
- Peritoneal function was not different between two groups
- Clinical journal of American society of nephrology

PD and risk in diabetic

- Glucose and insulin homeostasis altered in CKD even in the early stages of renal disease.
- Metabolic syndrome:Obesity, insulin resistance, high blood pressure, dyslipidemia, usual companion of CKD in diabetic patients.
- Absorption of 100-300gr glucose from Pd fluids must consider a problem.
- BMI is not a good marker in patients as muscle must be considered not fat tissue.

- More recents cohort safely support PD prescription for diabetic patients, demonstrating similar long term patient patients survival in both modalities and that DM Peres should not be a barrier to PD and they can switch from one kind of treatment to another.

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 statu
(9) Lack of pain from needle puncture	(9) Feasibility of elective intraperitoneal insulin	
(10) Lower rate of delayed renal graft function		

Volumes intra vascular

- High glucose level induce thirst and it can be induce over load and pressure to heart so controlling blood glucose is essential in them.

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Peritoneal Dialysis in Diabetics: There Is Room for More
Dialysis in Diabetics: There Is Room for More : Table 2

Table 2: Strategies to improve clinical outcomes in PD diabetic patients.

Strategies	Practice
(1) Opportune nephrology referral	More than 3 months before dialysis initiation, ideally when GFR ≤ 30 mL/min
(2) Residual renal function protection	Avoidance of dye studies, nonsteroidal antiinflammatory drugs (including cyclooxygenase-2 inhibitors), aminoglycosides, and extracellular fluid depletion
(3) Control of cardiovascular risk factors	Diet counseling and promotion of physical activity to avoid obesity; pharmacologic therapy for hypertension atherogenic dyslipidemia, dysglycemia and prothrombotic state (ACE inhibitors, AII receptor antagonists, B blockers, statins, and aspirin)
(4) Patient education and multidisciplinary support	Group discussion and individual consultation (booklets, video, and interview) promotion of hometherapy and transplantation (both renal and renopancreatic) glycemic control optimization foot care and peripheral vascular evaluation ophthalmologist followup
PD specific strategies	
(5) Skilled volume evaluation and control	Panel of clinical evaluation (blood pressure, weight, and edemas), biomarker (pro BNP) and multifrequency BIA (longitudinal trends of body composition) high-dose furosemide fluid, and sodium restriction elective use of icodextrine and APD
(6) Preferential use of low GDP solutions, glucose sparing regimens, and individualized low calcium solutions	Avoidance of hypertonic bags use Bi/tri compartment bag solutions (low GDP) individualized low Ca solutions prescription "PEN" regimen: physioneal; extraneal; dianeal; "NEPP" regimen: 1 amino acid exchange, 1 icodextrin exchange, and 2 glucose bicarbonate/lactate exchanges as options
(7) Nutritional evaluation and support	Assessed by a panel: subjective global assessment (SGA), protein equivalent of nitrogen appearance (nPNA), serum albumin and lipid profile, multifrequency BIA diet counseling by nutritionist
	Enteric supplements (protifar as protein supplement) peritoneal supplement (nutrineal once day)
(8) Preferential use of RAAS acting drugs	ACEI and ARB as first antihypertensive drugs possible protective effects in peritoneal membrane status
(9) Optimize technique survival and opportune transfer to HD	International recommendations on peritoneal access management and prophylactic measures individualized training and retraining peritonitis rate systematic control and quality assessment individualized APD prescription depression assessment and specific management routine annual peritoneal membrane evaluation

Study of 432 incident patients

- In spite of the detrimental effect of diabetes on survival compared to non diabetic(77%,52vs86%, 72% two and four years.)

- It is noteworthy that diabetes was not associated with Lower technical survival in CAPD

- Pdi2014nov

Disadvantage

- Gastroparesia worsen in PD and promotes anorexia and secondary malnutrition
- Glucose overload increases insulin resistance and makes it difficult to control the lipid profile
- Diabetic patients have a thicker ,poorly vascularised peritoneal membrane even before starting PD, as demonstrated in peritoneal biopsies after inserting the catheter.

A study

- In a study in England both techniques were similar, with slight advantage for PD in the first 2-3 years of evolution and HD later
- Some patients are just can be dialyzed by PD
- Pd catheter is much better than perm catheter

Managing in PD

- The treatment ofDM patients on Pd requires dedication and integrated monitoring to reduce cardiovascular risk on all fronts. Diet, excercise,and weight control, are crucial , as well as control of fluids intake, which reduces the use of hypertonic solutions

- Checking RRF and , protecting the kidney with harmful medicine for kidney like NSAID, contract, dehydration.

- Patient with preserves RRFhave less vascular calcification

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Causes of Drop-Out in Diabetic and Non-Diabetic Patients

TABLE 2
Causes of Drop-Out in Diabetic and Non-Diabetic Patients

Causes of drop-out	Total (*n*=432)	Diabetics (*n*=101)	Non-diabetics (*n*=331)
Death	94 (26.1%)	33 (37.1%)	61 (22.5%)
Cardiovascular	55 (58.5%)	20 (60.6%)	35 (57.4%)
Infection/technique	9 (9.6%)	2 (6.1%)	7 (11.4%)
Infection/non-technique	9 (9.6%)	4 (12.1%)	5 (8.2%)
Other	14 (14.9%)	4 (12.1%)	10 (16.4%)
Unknown	7 (7.4%)	3 (9.1%)	4 (6.6%)
Hemodialysis	151 (41.9%)	35 (39.3%)	116 (42.8%)
Infection	67 (44.4%)	11 (31.4%)	56 (48.3%)
Underdialysis/ultrafiltration failure	35 (23.2%)	9 (25.7%)	26 (22.4%)
Loss of autonomy for technique	14 (9.3%)	8 (22.9%)	6 (5.2%)
Psychosocial	8 (5.3%)	1 (2.9%)	7 (6.0%)
Abdominal complications	26 (17.2%)	5 (14.3%)	21 (18.1%)
Renal transplantation	104 (28.9%)	17 (19.1%)	87 (32.1%)
Renal function recovery	11 (3.1%)	4 (4.5%)	7 (2.6%)

NS = not significant.

Future for PD

- The future is via peritoneal membrane protection, minimizing glucose load, using new ,more biocompatible solution preventing peritoneal infection and developing specific treatment to prevent peritoneal fibrosis

Negotiations for volume over load

- Volume over load is common in diabetic patients on CAPD , especially when the RRF declines with time on PD, due to higher dietary salt and fluid intake, they become over load and need higher glucose solution.

- In a study in China with a Dietitian and nurse they negotiate with patients and most of them decrease the salt and fluid intake.

Peritoneal changes in diabetic

- Before starting PD, peritoneal membrane changes like other capillaries, similar to retina, this may be due to reduction in the fixed negative charges of the capillary basement membrane.

- Leakage of albumin in PD fluids are prevalent in diabetic due to high transporter of membrane.especially in older age.

Study on PD

- PD is an effective long term replacement therapy in diabetic, without higher rates of technique failure, ultafiltration failure or peritonitis.better outcomes were achieved in the contemporary cohort. The menace of autonomy loss due to stroke and higher hospitalization rates rates enhance the need for assisted Pd strategies and better control of comorbidities.

- In short, PD as a technique appears to be at least as good as HD for RRT patient , therefore choice must be considered in decision - making process in most cases.