IInfluence of glucose solutions on the development of hyperglycaemia in peritoneal dialysis. Behaviour of glycated haemoglobin and the lipid profile

Nefrologia 2014;34(4):530-1
doi:10.3265/Nefrologia.pre2014.Mar.12394

Sr. Director:

Peritoneal dialysis (PD) is a technique that exposes the patient to glucose solutions and may cause metabolic complications, such as central obesity, hypertriglyceridaemia and hyperglycaemia. Glucose absorbed from the peritoneal cavity may lead to the development of insulin resistance (IR) and *de novo* diabetes[1]. Furthermore, exposure to glucose degradation products (GDP) leads to structural and functional damage of the peritoneal membrane[2]. In a study by Fortes et al., PD patients had higher fasting glucose, glycated haemoglobin (HbA_{1C}) and estimated IR rate using the HOMA-IR index[3] than haemodialysis patients. In addition, patients who receive dialysis with glucose-free dialysate show a lower absorption of glucose, lower weight gain and fat accumulation, and improved IR and dyslipidaemia[4]; furthermore, the use of icodextrin leads to increased adipocytokines in the plasma of PD patients, without changes in cholesterol levels, but with a reduction in triglycerides[5]. In a study aimed at observing differences in the lipid profile of 22 non-diabetic patients on PD between 6 and 48 months compared to a control group of a similar age, there were significantly higher levels of very low-density lipoproteins, cholesterol bound to low-density lipoproteins and triglycerides, and significantly lower levels of cholesterol bound to high-density lipoproteins compared to the control group[6]; using a 72-hour continuous glucose-monitoring system, we studied the effect of PD glucose solutions on patient glucose levels and we observed that the percentage of glucose levels above 90mg/dl was influenced by high glucose concentrations in the fluids and the high transporter state. However, a Spanish study recently published that non-diabetic PD patients did not have a significant increase in HOMA-IR levels, or modifications to these values after one year of treatment on PD, or statistically significant changes in the lipid profile[7].

We carried out a retrospective observational study with 39 non-diabetic PD patients of the Hospital Clínico San Carlos de Madrid, 26 on continuous ambulatory PD and 13 on automated PD, of 61±14 years of age, in which we analysed baseline glucose and lipids (total cholesterol and triglycerides) before beginning PD and after 1, 3, 6, 12, 18, 24, 30 and 36 months using the technique, and a prospective 12-month study in 18 of the patients, also analysing HbA_{1C}. We studied time on PD, the type of PD, the type of transporter and use of solutions with a high glucose load (two or more exchanges at 2.3%) or a low load (fewer than two at 2.3% and/or icodextrin). We only used fluids with a high glucose load in 6 patients and we did not use 3.86%-4.25% solutions in any patient. The type of transporter was high (medium-high, high) in 16 and low (medium-low, low) in 23.

We did not find significant differences between the pre-PD glucose means and those found over the 36 months of follow-up (Table 1), which remained at normal levels throughout the study. Cholesterol levels rose suddenly in the sixth month with respect to baseline values (171±45 vs. 193.5±46mg/dl; *P*=.008), without changes in the triglyceride figures and with normal levels being maintained in both factors throughout follow-up. In the prospective study with 18 patients, we did not observe significant differences in glycaemia evolution: baseline 103±14 vs. 105±17 after 1 month, 112±14 after 3 months, 108±20 after 6 months and 104±14mg/dl after 12 months. No significant differences were observed in HbA_{1C}: baseline 5.5±0.5 vs. 5.5±0.5 after 1 month, 5.4±0.6 after 3 months, 5.7±0.8 after 6 months and 5.4±0.6%

Table 1. Evolution of glycaemia in peritoneal dialysis.

	Glycaemia	No.	Mean±SD	*P*
Par 1	Baseline	39	93.8±13.8	0.77
	1 month	39	99.5±16	
Par 2	Baseline	39	98.8±13.8	0.05
	3 months	39	104.9±18	
Par 3	Baseline	37	98.6±14	0.38
	6 months	37	101±16.4	
Par 4	Baseline	31	97.9±14	0.55
	12 months	31	98±11.2	
Par 5	Baseline	27	98±14.9	0.81
	18 months	27	98.9±12.2	
Par 6	Baseline	23	97.8±14.9	0.52
	24 months	23	100.2±1.2	
Par 7	Baseline	17	96.3±12.7	0.72
	30 months	17	97.7±8.14	
Par 8	Baseline	13	94.4±8.9	0.58
	36 months	13	97±14.1	

SD: standar desviation.

after 12 months. Glycaemia and HbA_{1C} do not seem to change in accordance with the glucose load. There is a good correlation between glucose and HbA_{1C}. High transporters have higher glucose values after one month on PD (*P*=.039), but not of $HbA_{1C.}$

During the first years in which PD has been reported, and on the basis of the glucose load that was contributed to obtain sufficient ultrafiltration, it was considered to be a dialysis technique with a potential diabetogenic effect. It is possible that in these first few years, due to a lack of knowledge about the deleterious effect that glucose contribution has on the peritoneum with the development of GDP[2], the relatively common use of very hypertonic solutions, which furthermore did not use bicarbonate as a buffer, may have caused some cases of diabetes.In the last decade since the introduction of solutions in dual chambers with a mixture of lactate and bicarbonate or bicarbonate alone, with which the formation of GDP is minimal and use of 3.86%-4.25% glucose PD dialysate is practically nil, the induction of diabetes and even the development of moderate hyperglycaemia, as our study shows, have become anecdotal. The increase in lipids reported in some articles[6] is not relevant in our study in terms of its maintenance over time and it has not been confirmed by other authors[7].

In conclusion, our non-diabetic PD patients treated with glucose solutions did not show changes in their glucose levels throughout the 36 months on dialysis. HbA_{1C} was unchanged after a year on the technique. The potential development of diabetes in PD was not confirmed by our results.

Conflicts of interest

The authors declare that they have no conflicts of interest related to the contents of this article.

1. Szeto CC, Chow KM, Kwan BCH, Chung KY, Leung CB, Li PKT. New-onset hyperglycemia in nondiabetic Chinese patients started on peritoneal dialysis. Am J Kidney Dis 2007;49:524-32.
2. Kim YL, Cho JH, Choi JY, Kim CD, Park SH. Systemic and local impact of glucose and glucose degradation products in peritoneal dialysis solution. J Ren Nutr 2013;23(3):218-22.
3. Fortes PC, de Moraes TP, Mendes JG, Stinghen AE, Ribeiro SC, Pecoits-Filho R. Insulin resistance and glucose homeostasis in peritoneal dialysis. Perit Dial Int 2009;29:S145-8.
4. Cho KH, Do JY, Park JW, Yoon KW. Effect of icodextrin dialysis solution on body weight and fat accumulation over time in CAPD patients. Nephrol Dial Transplant 2010;25:593-9.
5. Furuya R, Odamaki M, Kumagai H, Hishida A. Beneficial effects of icodextrin on plasma level of adipocytokines in peritoneal dialysis patients. Nephrol Dial Transplant 2006;21:494-8.
6. Johansson AC, Samuelsson O, Attman PO, Haraldsson B, Moberly J, Knight-Gibson C, et al. Dyslipidemia in peritoneal dialysis-relation to dialytic variables. Perit Dial Int 2000;20:306-14.
7. Sánchez-Villanueva R, Estrada P, del Peso G, Grande C, Díez JJ, Iglesias P, et al. Análisis repetido de la resistencia insulínica estimada mediante índice HOMAIR en pacientes no diabéticos en diálisis peritoneal y su relación con la enfermedad cardiovascular y mortalidad. Nefrologia 2013;33(1):85-92.

Margarita Delgado-Córdova[1], Francisco Coronel[2], Fernando Hadah[2], Secundino Cigarrán[3], J. Antonio Herrero-Calvo[2]

[1] Universidad Autónoma de Chile. Santiago de Chile; [2] Servicio de Nefrología. Hospital Clínico de San Carlos. Madrid. (Spain). (España); [3] Sección de Nefrología. Hospital da Costa. Burela, Lugo (Spain).

Correspondence: Francisco Coronel
Servicio de Nefrología.
Hospital Clínico de San Carlos.
C/ Comunidad de Baleares, 1. 28231 Madrid. (Spain).
franciscoronel@yahoo.es

Results 5 years after living donor renal transplantation without calcineurin inhibitors

Nefrologia 2014;34(4):531-4
doi:10.3265/Nefrologia.pre2014.May.11810

To the Editor,

Calcineurin inhibitor-based (CNI) immunosuppression regimens have improved the outcomes of renal transplantation. Unfortunately, the use of CNI has been associated with interstitial fibrosis and tubular atrophy, affecting graft function and graft survival[1]. In order to avoid exposure to CNI, agents such as sirolimus (SRL) have emerged as new therapeutic options. Therapeutic strategies with SRL include the minimisation, suspension, elimination and total absence of CNI[2].

Experiences with CNI-free SRL/mycophenolate mofetil (MMF)/ST immunosuppression have not obtained sufficient acute rejection (AR) prophylaxis[3]. The introduction of induction therapy improved AR rates and short-term efficacy (1-3 years) with contradictory results[4-7]. We previously reported excellent and satisfactory results after 1 and 3 years without CNI[8,9] and we now present an observational and retrospective study of efficacy and safety after 5 years of the SRL/MMF/ST regimen compared with cyclosporine (CS)/MMT/ST and selective induction with basiliximab in 41 patients enrolled between May 2004 and January 2005.

The study design has previously been reported in detail[8]. In this report, the results were analysed in two populations: the intention-to-treat (ITT) population, which included all patients with a functioning graft, and the population on treatment (OT), which included patients who were maintained on the same original study immunosuppression regimen.