C) BRIEF CASE REPORTS

Peritoneal dialysis allows successful cardiac transplantation in patients with refractory heart failure

Nefrologia 2015;35(1):121-4
doi:10.3265/Nefrologia.pre2014.Sep.12570

To the Editor,

The term cardiorenal syndrome (CRS) describes the clinical situation in which heart and kidney function are simultaneously compromised, which perpetuates the progression of damage in both organs[1].

In type II CRS, chronic heart failure (HF) may accelerate the chronic deterioration of renal function, which itself may cause fluid overload, resistance to the effect of diuretics and, lastly, refractory HF (RHF) with normal treatment. When patients are not candidates for cardiac transplantation (CT), they have the option of palliative treatment[2] or newer alternatives, amongst them ultrafiltration (UF) techniques with the nephrologist having an active role[2]. UF by peritoneal dialysis (PD) may provide some advantages over haemodialysis (HD), such as a better preservation of residual renal function, better haemodynamic stability, continuous UF, etc.[3-5]. The best solution would be CT. Furthermore, there are previous conditions that increase post-transplant morbidity and mortality and may make it contraindicated, such as systemic diseases with poor prognosis (e.g. advanced renal failure) and severe pulmonary hypertension.

Our approach is that since it improves the clinical and functional status of patients, PD may be an instrument that contributes to a better condition before CT and facilitates its implementation and a better outcome.

CASE REPORT

Before the start of PD (Table 1): male, 47 years old, severe HF (New York Heart Association class III-IV) secondary to dilated cardiomyopathy of ischaemic aetiology, revascularised and without a possibility of further revascularisation, optimal treatment-resistant, with a poor quality of life (a score of 16 in the SF-36 questionnaire), continuous admissions and prolonged hospitalisation (more than 150 days accumulated in one year). The diuretic doses displayed in the Table refer to chronic home treatment. During admissions and flare-ups the patient received high doses of intravenous furosemide (>500mg), thiazides and they were even combined with potassium-sparing diuretics. Systolic and diastolic dysfunction. Severe pulmonary hypertension (PH), resistant to medical treatment (sildenafil and iloprost). Severe mitral insufficiency. Stage III chronic kidney disease (CKD).

The possibility of CT was studied, but because of the multiple admissions due to episodes of CHF and severe PH, the indication and definitive inclusion time was delayed.

The decision was made to include him in the UF programme with PD: manual PD (continuous ambulatory peritoneal dialysis [CAPD]) of only one exchange per day of 10-12 hours (nocturnal) with icodextrin solution, without daytime dialysis or exchanges, every day.

Three months after starting PD, the patient was clinically and haemodynamically stable, with a good clinical course (Table 1): improvement of the functional HF class, no admissions, reduction of oedema, an improvement of echocardiographic parameters without a deterioration of renal function (glomerular filtration rate >60ml/min) and with restored response to diuretics, without PD-related complications and with a considerable improvement in his quality of life (60 points in the SF-36).

He received a CT four months after the start of PD. He has remained haemodynamically stable during the post-operative period. Diuresis has been maintained without deterioration of renal function. No signs of HF. Good cardiac graft evolution without rejection. Two months after CT, the peritoneal catheter was removed, with no reintroduction of peritoneal UF being necessary to date (Table 1).

DISCUSSION AND CONCLUSIONS

The nephrologist and UF techniques are taking on a priority and key role in RHF, being proposed as an alternative level of treatment, with a priori promising results. It has shown an improvement in symptoms, a decrease in re-admissions, pulmonary and peripheral oedema, an improvement in functional class, renewed response to diuretics, a decrease in circulating proinflammatory cytokines, and even an improved glomerular filtration rate[2,3]. UF with PD may provide, as has been mentioned, advantages over HD[2,6], and its different methods can be used (CAPD, automated peritoneal dialysis) as well as new solutions, as is the case of icodextrin[7]. The latest studies reinforce the beneficial effect of PD in this type of patient (Table 2), expressed as an improvement in cardiac function, hospitalisation, symptoms and even mortality, even in patients with CKD not at end-stage, and it is also a cost-effective treatment against RHF with many hospitalisations and conventional treatments[5,8-10].

Taking into account that these patients have relatively complex situations, such as prolonged hospitalisation or the difficulty in accessing CT, including PD as the last option in their treatment may be the key to allowing them a

Table 1. Evolution of clinical, functional, laboratory, volume and complementary parameters before peritoneal dialysis, one month after the introduction of the technique and one month after cardiac transplantation

	Evolution of clinical and functional parameters		
	Pre-PD	**After 3 months of PD**	**One month after CT**
Weight (kg)	85	72	70
SBP (mmHg)	90	100-110	110
DBP (mmHg)	50	50	65
Heart rate (bpm)	94	80	80
Oedema	Yes, major	No	No
NYHA class	III-IV	II	I-II
CKD stage	III	II	No CKD
Furosemide (mg/day)[a]	120	40-80	40
Hydrochlorothiazide (mg/day)[a]	50	0	0
ACE inhibitors/ARBs	Yes	No	No
No. admissions due to CHF	8 in 12 months	0	0 due to CHF
No. days hospitalised	150 in 12 months	0	0 due to CHF
Quality of life SF-36	18	60	75
	Evolution of laboratory and volume parameters		
	Pre-DP	**After 3 months of PD**	**One month after CT**
Hb (g/dl)	14	13,8	10,5
Creatinine (mg/dl)	1,6	1,4	0,78
Urea (mg/dl)	50	50	65
GFR (ml/min)[b]	57	61	> 60 ml/min
Sodium (mEq/l)	130	138	135
Potassium (mEq/l)	3,9	4,1	4,2
Diuresis (ml/24h)	300-500	800-1000	1500-1600
Peritoneal UF (ml/24h)	-	400-500	-
	Evolution of complementary parameters		
	Pre-DP	**After 3 months of PD**	**One month after CT**
Chest x-ray	Increased CTR Bilateral pleural effusion	Increased CTR Right basal pleural effusion	No cardiomegaly Without effusion or consolidation
Abdominal ultrasound	Stasis liver Ascites	Stasis liver	Normal
ECG	RS a 70 lpm Q V1-V6, I, aVL waves	SR at 80bpm Q V1-V6, I, aVL waves	SR at 80bpm Normal repolarisation
LVEF:	15-20 %	36 %	70 %
Dimensions RV	Significant dilatation 68mm	Dilatation RV 58mm	Normal 40mm
Pulmonary pressure	Severe PH 45-50	Improved PH 40mmHg	30mmHg

ARBs: Angiotensin receptor blockers; ECG: electrocardiogram; CKD: chronic kidney disease; LVEF: left ventricular ejection fraction; GFR: glomerular filtration rate; PH: pulmonary hypertension; CHF: congestive heart failure; ACE inhibitors: angiotensin-converting enzyme inhibitors; bpm: beats per minute; NYHA: New York Heart Association; pre-PD: before peritoneal dialysis; SR: sinus rhythm; DBP: diastolic blood pressure; SBP: systolic blood pressure; CT: cardiac transplantation; UF: ultrafiltration; LV: left ventricle.

[a] Diuretics dose: during flare-ups and hospitalisation the patient received high doses of furosemide [>500mg/day] and thiazides and they were combined with potassium-sparing diuretics.

[b] Estimated GFR using the MDRD formula. After transplantation the patient had creatinine clearance measured by Cockroft-Gault of 85ml/min.

Table 2. Clinical experiences since 2010

	Number of patients	Survival	Hospitalisations	Functional benefits
Nakayama 2010	12 (PD)	Median 75% after 26 months	>3 per year before PD, no subsequent admissions due to HF	In all, the NYHA class improved from III(9)-IV(3) to I(9) and II(3)
Sotirakopuolos 2011	19 (PD)	68% after one year 42% after two years	Before PD: 5-20 days/month/patient No subsequent admissions due to volume problems	The average LVEF improved from 28% to 36% Mean weight loss of 5kg
Cnossen 2012	12 (PD) 11 (HD)	Median of 16 months	Reduced admission due to cardiac causes in 1.4 to 0.4 days/month/patient	The NYHA class improved. PD = HD
Núñez 2012	28 (PD) 32 (controls)	PD reduced the RR of death: 0.4 (0.21-0.75)	84% reduction of hospitalisation in the first 6 months	Overall mortality was 63% after 16 months. Improved NYHA class and improvement in the quality of life questionnaires
Kunin 2013	37 (PD)	Median 14 months	It was reduced by 55% in long-term survivors	*Long-term survivors required fewer diuretics and their NYHA class improved by one grade*
Rizkallah 2013	10 (PD)	-	Reduction from 3.2 to 0.1 days/month/patient	Improved NYHA class, improved response to diuretics, weight loss of 7kg
Bertoli 2013	48 (PD)	85% after one year 56% after two years	Reduction from 43 to 11 hospitalisations per year	In the year of PD they had a mean of 3 admissions that required extracorporeal UF
Courivaud 2013	126 (PD)	58% after one year	Reduction from 3.3 to 0.3 days/month/patient	Improved LVEF

PD: peritoneal dialysis; LVEF: left ventricular ejection fraction; HD: haemodialysis; HF: heart failure; NYHA: New York Heart Association; RR: relative risk; UF: ultrafiltration.
Modified from Davies et al.[10]

more viable future, and more time at home and even access to interventional cardiac techniques (valvuloplasty, surgery, etc.) or even CT, as in our case.

Conflicts of interest

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

1. Ronco C, House AA, Haapio M. Cardiorenal and renocardiac syndromes: The need for a comprehensive classification and consensus. Nat Clin Pract Nephrol 2008;4:310-1.
2. Montejo JD, Bajo MA, del Peso G, Selgas R. Papel de la diálisis peritoneal en el tratamiento de la insuficiencia cardiaca refractaria. Nefrologia 2010;30(1):21-7.
3. Krisham A, Oreopulos D. Peritoneal dialysis in congestive heart failure. Adv Perit Dial 2007;23:82-9.
4. Quirós-Ganga PL, Remón-Rodríguez C, Gómez-Puerta JA, Orellana-Chávez C, Tejuca-Marenco M. Experiencia positiva en el tratamiento de la insuficiencia cardiaca refractaria con diálisis peritoneal. Nefrologia 2012;32 (Suppl 3):121.
5. Quirós-Ganga PL, Remón-Rodríguez C. Tratamiento con diálisis peritoneal del síndrome cardiorrenal con insuficiencia renal crónica leve. Nefrologia Suppl Ext 2012;3(3):47-52.
6. Mehrotra R, Kathuria P. Place of peritoneal dialysis in the management of treatment-resistant congestive heart failure. Kidney Int Suppl 2006;70:S67-71.
7. Bertoli SV, Ciurlino D, Maccario M, Martino S, Bigatti G, Traversi L, et al. Home peritoneal ultrafiltration in patients with severe congestive heart failure without end stage renal disease. Adv Perit Dial 2005;21:123-7.
8. Díez B, Suárez C, Vidau P, Gago E, Díaz Molina B, Martín Fernández M, et al. Papel de la diálisis peritoneal en el tratamiento de la insuficiencia cardiaca. Experiencia en nuestro centro. Nefrologia 2007;27:605-11.
9. Sánchez JE, Ortega T, Rodríguez C, Díaz-

Molina B, Martín M, Garcia-Cueto C, et al. Efficacy of peritoneal ultrafiltration in the treatment of refractory congestive heart failure. Nephrol Dial Transplant 2010;25:605-10.
10. Davies S, Lally F, Satchithananda D, Kadam U, Roffe C. Extending de role of peritoneal dialysis: can we win hearts and minds? Nephrol Dial Transplant 2014;29:1648-54.

Pedro L. Quirós-Ganga, César Remón-Rodríguez, Mercedes Tejuca-Marenco, Verónica de la Espada-Piña
UGC de Nefrología. Hospital Universitario Puerto Real. Cádiz.

Correspondence:
Pedro L. Quirós Ganga
UGC de Nefrología.
Hospital Universitario Puerto Real.
Vencejos, 2, 5º A. 11500,
Cádiz.
pedrol.quiros.sspa@juntadeandalucia.es
pedroquiros@ono.com