PERITONEAL PROTEIN LOSS – LINK WITH TRANSPORT RATE OR WITH NUTRITIONAL AND INFLAMMATORY PARAMETERS?

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INTRODUTION

Peritoneal protein leak (PPL) has marked inter and intra-individual variability. Apart its inherent dependence on peritoneal transport rate, protein loss is presumably induced by inflammation and has been related to worse clinical outcomes, such as cardiovascular events. Protein losses could be compensated by increased synthesis but high catabolism and inflammation could limit this compensation mechanism and contribute to mal nutrition.

The aim of this study was to characterize peritoneal protein loss (PPL) and associations with clinical variables, transport rate, nutritional and inflammatory parameters.

METHODS

-> Cross-sectional study of stable PD patients for more than 3 months. All used low-GDPs PD solutions.
-> We explored 24-h effluent PPL and peritoneal protein clearance (PrC) and correlated with multifrequency bioimpedance assessment, transport rate, dialysis prescription and laboratory parameters of inflammation and nutrition.
-> We explored peritoneal protein loss at firth 3 moths after PD start (T0) in available patients (n=48) and compared with cross-sectional variables.
-> All patients underwent PPL measurements from 24-h peritoneal dialysate effluent collections and PrC was calculated using the following formula: 24-h dialysate protein (g)/(serum albumin (g/dL)/0.4783)*100 expressed in ml/day.

RESULTS

Table 1 – Patients Characteristics

Variable	Total (n=50)
Age (years)	51 (41-62)
Masculine	26 (52)
Hipertension	47 (94)
Diabetes	6 (12)
Charson comorbility index	3 (2-4)
PD vintage (months)	23 (13-54)
PD as firth RRT	34 (86)
CAPD/APD	28 (56) / 22 (44)
D/P at 4h	0.8 (0.7-0.8)
RRF (mL/min/1.73 m2)	3 (0.4-5.7)
Anuric	12 (24)
Fresenius/Baxter	23 (46) / 27 (52.9)
Icodextrin	25 (50)
Daily exchange volume (L)	8.5 (5.8-13.3)
Daily ultrafiltration (L)	1.29 (1-1.8)
Kt/V peritoneal	1.36 (1.11-1.74)
nPCR (g/Kg/day)	1.(0.9-1.3)
Total protein (mg/dL)	6.5 (6.1-6.8)
Albumin (mg/dL)	4 (3.8-4.2)
Creatinine (mg/dL)	8.8 (6.9-12.2)
C-reactive Protein (mg/L)	2.8 (0.7-8.9)
Ferritin (ng/dL)	304.5 (122.5-523)
Body Mass Index (Kg/m²)	26.1 (23-29.1)
Extra-cellular water (L)	17.1 (14.2-18.9)
Intra-cellular water (L)	18.9 (15.5-21.6)
Lean tissue index (kg/m²)	12.9 (11.6-15.4)
Fat tissue index (Kg/m²)	11.4 (8.6-16.4)
Body Cell Mass (Kg)	20 (15.5-26.3)
PPL (g/day)	4.8 (4.1-6)
PrC (ml/day)	56.2 (49.9-71.3)
PPL at T0 (g/day)	5.1 (4.4-6.3)
PrC at T0 (ml/day)	62 (53.4-79)

Table 2 – PPL , PrC and PPL at T0 for categorical variables

Variable		PPL (g/day)	p val	PrC (ml/day)	p val	PPL (g/day) at T0	p val
Masculine		**5.4 (4.4-6.3)**	0.031	66.2 (51-79)	0.095	5.2 (4.5-6.7)	ns
Feminine		**4.4 (3.9-5.4)**		52.6 (47.7-67.4)		5 (3.9-6)	
Diabetes	Yes	6 (5.3-6.5)	0.075	76.2 (61-89.3)	0.053	**6.7 (5.6-7.7)**	0.019
	No	4.7 (4.1-5.7)		55.4 (48.6-70.8)		**5 (4.2-5.9)**	
HT	Yes	**5 (4.1-6)**	0.001	**58.5 (51.1-71.7)**	0.002	5 (4.3-6.1)	ns
	No	**3.4 (3.3-3.4)**		**38.8 (38-39.6)**		6.5 (5.7-7.4)	
PD-first	Yes	4.7 (4.1-5.6)	ns	56.2 (50.7-67.6)	ns	**4.7 (4.2-5.8)**	0.014
	No	5.9 (3.9-6.6)		74.7 (45.2-88.6)		**5.9 (5-7.5)**	
CAPD		4.9 (4-5.9)	ns	57.2 (48.9-70.7)	ns	5.1 (4.2-5.9)	ns
APD		4.7 (4.1-6)		58.2 (46.4-77.9)		5.1 (4.6-7.6)	
Fresenius		5.2 (4.4-6.2)	ns	61.5 (52.1-75.7)	ns	5.1 (4.1-6.6)	ns
Baxter		4.6 (4-5.9)		55.7 (45.1-70.9)		5 (4.4-6.1)	
Icodextrine	Yes	4.6 (4-6)	ns	55.7 (45.3-71.1)	ns	4.9 (4.4-5.9)	ns
	No	5.2 (4.3-6)		61.5 (51.9-71.9)		5.2 (4.3-6.7)	

Table 3 – PPL and PrC univariate correlations with clinical and laboratory parameters

Variable	PPL (g/day)		PrC (ml/day)	
	R2	p val	R2	p val
Age (years)	-0.005	ns	0.056	ns
Charson comorbility index	0.093	ns	0.062	ns
PD vintage (months)	-0.174	ns	-0.173	ns
D/P at 4h	0.06	ns	0.089	ns
RRF (mL/min/1.73m²)	0.067	ns	0.079	ns
Daily exchange volume (L)	0.180	ns	0.145	ns
Daily ultrafiltration (L)	-0.153	ns	-0.199	ns
Kt/V peritoneal	0.111	ns	0.141	ns
nPCR (g/Kg/day)	0.198	ns	0.155	ns
Total protein (mg/dL)	0.108	ns	-0.055	ns
Albumin (mg/dL)	-0.188	ns	-0.459	0.001
Creatinine (mg/dL)	0.049	ns	-0.042	ns
C-reactive Protein (mg/L)	0.151	ns	0.156	ns
Ferritin (ng/dL)	0.278	0.051	**0.319**	0.024
Extra-cellular water (L)	**0.379**	0.007	**0.332**	0.017
Intra-cellular water (L)	**0.460**	0.001	**0.391**	0.005
Lean tissue index (kg/m²)	**0.386**	0.006	**0.361**	0.009
Fat tissue index (Kg/m²)	**-0.302**	0.033	**-0.299**	0.033
Body Cell Mass (Kg)	**0.460**	0.001	**0.412**	0.003
PPL (g/day)	-	-	**0.955**	<0.001
PrC (ml/day)	**0.955**	<0.001	-	-
PPL at T0 (g/day)	**0.355**	0.016	**0.362**	0.014

Table 4 - Multivariate linear regression model for factors predictors of PPL (R2=0,509, constant=3.9, p value<0.001, n=50)

Variable	Coeficiente B	p val
Hypertension	**0.348**	0.006
Diabetes	0.169	ns
Gender	-0.229	ns
Ferritin (ng/dL)	0.177	ns
Extra-cellular water (L)	0.244	ns
Intra-cellular water (L)	-0.608	ns
Lean tissue index (kg/m²)	-1.2	ns
Fat tissue index (Kg/m²)	-0.022	ns
Body cell mass (Kg)	2.14	ns

Table 5 - Multivariate linear regression model for factors predictors of PrC (R2=0,507, constant=72,8, p value<0.001, n=50)

Variable	Coeficiente B	p val
Hypertension	**0.280**	0.026
Diabetes	**0.274**	0.048
Gender	-0.376	ns
Ferritin (ng/dL)	0.210	ns
Extra-cellular water (L)	0.511	ns
Intra-celular water (L)	-1.89	ns
Lean tissue index (kg/m2)	-1.55	ns
Fat tissue index (Kg/m2)	0.118	ns
Body cell mass (Kg)	3.6	ns

DISCUSSION/CONCLUSION

-> Daily peritoneal protein loss is associated with hypertension and diabetes.

-> In our sample peritoneal protein loss was not associated with transport rate, PD schedule, inflammation and laboratory markers of nutrition.

-> Although there was no statistically significant difference in the multivariate analysis, we found an unexpected link of peritoneal protein flux with parameters of body protein stores.

-> PD-first was associated with lower protein loss at PD start but not at the cross-sectional time.

Table 6 - Multivariate linear regression model for factors predictors of PPL at T0
(R2=0.208, constant=6.34, p value=0.037, n=48)

Variable	Coeficiente B	p val
Hypertension	-0.131	ns
Diabetes	0.207	ns
Age	0.097	ns
PD-first	**-0.306**	0.041

References: *Advances in Peritoneal Dialysis*, Vol. 25, 2009; Clinical Kidney Journal, 2016, vol. 9, no. 3, 374–380; Clin J Am Soc Nephrol 10: 1192–1200, 2015; Kidney International (2008) 73, 334–340; *Clin J Am Soc Nephrol* 4: 1201-1206, 2009; Nephrol Dial Transplant (2009) 24: 1009–1014; Peritoneal Dialysis International, Vol. 25, pp. 445–452; *Clin J Am Soc Nephrol* 6: 561–566, 2011.

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