AGE AND DIALYSIS VINTAGE EFFECTS ON THE TWO PORE MODEL PARAMETERS FOR PERITONEAL DIALYSIS

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OBJECTIVES

The pore model of peritoneal transport provided interesting interpretation for many phenomena. Here we analyzed if transport parameters estimated for individual patients provide better correlations when taking into account also clinical characteristics (as age and dialysis vintage) in addition to directly measured indices.

METHODS

The study was carried out in 33 stable prevalent peritoneal dialysis (PD) patients (15 women) with mean age of 58 ± 16 years and body weight of 77.4 ± 18.9 kg who had been on PD, dialysis vintage, for a median of 20 (range 3 - 100) months. Sequential peritoneal equilibration test (sPET, Galach et al, NDT 2013) based on the consecutive performance of peritoneal equilibration test (PET, 4 h, glucose 2.27%) and mini-PET (1 h, glucose 3.86%) was applied and estimation of parameters of the two pore model (Waniewski et al., ASAIO J 2014) was performed. The Spearman correlation coefficient rho was used for the analysis of correlations.

RESULTS

Patient age and dialysis vintage were statistically independent. Fluid transport parameters correlated negatively with patient age (net UF at mini PET, net UF at PET, small pore water transport, free water transport, **Table 1**), but no such correlation was found for indicators of small solutes and protein transport, except for sodium D/P in mini-PET (Table 1) that depends on free water transport. In contrast, dialysis vintage had less impact on the observational indices, except for small pore water transport and free water fraction (Table 1). The hydraulic permeability, LpS, was found to decrease with age, while the fractional contribution of ultrasmall pores, α_u, increased (**Table 2**). As a consequence, the reflection coefficient for glucose was higher for older patients; nevertheless the osmotic conductance for glucose, OCG, was lower (Table 2). Among solute parameters, only diffusive permeability PS for glucose was positively correlated with patient age (Table 2). The fluid transport parameters correlated in a similar way with dialysis vintage as with age, with lower LpS and osmotic conductance for glucose, OCG, and peritoneal absorption rate, PA, but with higher fractional contribution of ultrasmall pores for patients with longer time on PD (Table 2). Only PS for sodium correlated with dialysis vintage (Table 2). Clearances of albumin and IgM were independent of age and dialysis vintage.

Table 1. Observational transport parameters measured during sPET and their correlation to patient age and dialysis vintage

Parameters	Parameter value	Correlation with age	Correlation with dialysis vintage
mini PET			
Net ultrafiltration [mL] [a]	375 ± 107	-0.62	NS
Ultrafiltration small pores[b] [mL]	168 ± 107	-0.36	-0.37
Free water transport [mL][c]	207 ± 62	-0.41	NS
Free water fraction [%][d]	58 ± 20	NS	0.37
D/P Sodium	0.85 ± 0.03	0.38	NS
Dip D/P Sodium	0.077 ± 0.028	NS	NS
Albumin clearance	0.127 ± 0.049	NS	NS
PET			
Net ultrafiltration [mL]	168 ± 168	-0.53	NS
D/P Creatinine	0.66 ± 0.10	NS	NS
D/D0 Glucose	0.36 ± 0.07	NS	NS
Albumin clearance	0.099 ± 0.038	NS	NS
IgM clearance	0.020 ± 0.013	NS	NS

Table 2. Pore model transport parameters estimated using sPET data and their correlation to patient age and dialysis vintage

Parameters[a]	2p model	Correlation with age	Correlation with dialysis vintage
Fluid transport			
LpS [mL/min/mmHg]	0.033 ± 0.022	-0.46	-0.59
PA [mL/min]	1.3 ± 0.95	NS	-0.55
α_u	0.07 ± 0.07	0.35	0.55
α_s	0.93 ± 0.07	-0.35	-0.55
σ_G	0.104 ± 0.066	0.35	0.55
OCG [mL/min/mmHg]	0.0023 ± 0.0008	-0.47	-0.52
Solute transport			
PS_G [mL/min]	7.7 ± 2.3	0.36	NS
PS_{Na} [mL/min]	4.2 ± 3.5	NS	0.37
PS_U [mL/min]	15.9 ± 3.7	NS	NS
PS_{Cr} [mL/min]	8.0 ± 2.8	NS	NS
PS_P [mL/min]	9.5 ± 3.3	NS	NS

CONCLUSIONS

The new approach - application of sPET for collection of clinical data on peritoneal transport and the two pore model of peritoneal transport for the mechanistic analysis of sPET data - is a feasible method that provides values of transport parameters in line with previous studies. Fluid transport parameters (PA, LpS, OCG) did not associate with solute transport parameters (PS) whereas - in contrast to transport parameters for small solutes and proteins - they correlated with patient age and dialysis vintage. The transport parameters of the two pore model had generally similar, but stronger, dependence on dialysis vintage than on patient age.

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