EXTENDED VERSION OF SEQUENTIAL PERITONEAL EQUILIBRATION TEST: LARGE PORES AND MACROMOLECULAR TRANSPORT

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Sequential peritoneal equilibration test (sPET, Galach et al, 2013) that is based on the assessment of net ultrafiltration, urea, glucose, and sodium may be extended by including more solutes and in particular, macromolecules, to allow for the estimation of the fraction of large pores in the peritoneal transport barrier and extended assessment of small solute transport.

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Sequential peritoneal equilibration test, which consists in consecutive peritoneal equilibration test, PET (glucose 2.27%, 4 h), and miniPET (glucose 3.86%, 1 h), was performed in 32 patients on continuous ambulatory peritoneal dialysis and the concentrations of urea, creatinine, glucose, sodium, phosphate and IgM were measured in plasma and dialysis fluid samples as prescribed for these two tests. The initial vasodilatation with the increased exchange surface area by 67% over the basic value was taken into account. Peritoneal transport parameters: basic hydraulic permeability LpS, contribution of ultrasmall pores, α_U, small pores, α_S, and large pores, α_L, to LpS, osmotic conductance for glucose, OCG, peritoneal fluid absorption PFA, and basic diffusive mass transport parameters, PS, for small solutes were estimated using the patient data and the three-pore (3p) model with the assumed pore radii of 43 A for small pores, 250 A for large pores, and water-only permeable ultrasmall pores.

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The patient had good net ultrafiltration in PET of 184 ± 162 mL and in miniPET of 370 ± 109 mL. The sodium dip in miniPET was 0.078 ± 0.030, and free water fraction was 0.59 ± 0.22. The estimated hydraulic permeability, LpS, was 0.054 ± 0.026 mL/min/mmHg (0.074 for 3p model), and peritoneal fluid absorption, PFA, was 1.1 ± 0.9 mL/min (0.3 for 3p model).
The fractional contribution of different types of pores to hydraulic permeability were:
α_U = 0.039 ± 0.042 for ultrasmall pores (0.02 in 3p model),
α_S = 0.836 ± 0.095 for small pores (0.90 in 3p model),
α_L = 0.124 ± 0.081 for large pores (0.08 in 3p model),
that resulted in the reflection coefficient for glucose of 0.066 ± 0.041 (0.049 for 3p model) and basic osmotic conductance for glucose OCG = 0.0029 ± 0.0010 ml/min/mmHg (0.0036 for 3p model).
Basic diffusive mass transport parameters, PS, were 17.3 ± 5.0 mL/min for urea, 8.7 ± 3.5 mL/min for creatinine, 8.2 ± 2.5 mL/min for glucose, 5.1 ± 9.2 mL/min for sodium, and 10.4 ± 4.3 mL/min for phosphate. The initial values of LpS, OCG, and PSs should be considered 1.67 times higher than the basic values.

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The extended version of sPET was able to provide a relatively complete characteristics of the peritoneal transport membrane assumed in the 3p model. In our group of patients it yielded the 3p model parameters with higher contribution of ultrasmall pores and large pores than typically assumed in this model. Also peritoneal fluid absorption was closer to clinical assessments than to the value of 0.3 mL/min typically assumed in the 3p model. High variability in the composition of the pore system between the patients was found.

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Galach M, Antosiewicz S, Baczynski D, Wankowicz Z, Waniewski J. Sequential peritoneal equilibration test: a new method for assessment and modeling of peritoneal transport. *Nephrology Dialysis Transplantation* 2013, 28: 447–454