Table 1. Representation of ultrfiltration (UF) and dialysate osmolality (OM) profiles

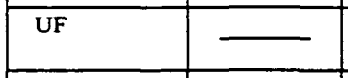
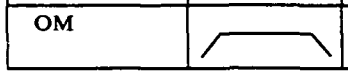
Profile	1	2	3	4	5	6	7
UF							
OM							

Table 2. Average (±error std) HD and SE scores of the eight patients during six sessions for each of the seven profiles. Comparison of the six first profiles with the standard profile seven

Profile	1	2	3	4	5	6	7
Score HD	−0.9±0.4	−0.6±0.2	−1.8±0.2	−1.25±0.4	−1.6±0.4	−0.8±0.3	−1.2±0.4
P	NS	<0.01	NS	NS	NS	NS	
Score SE	0.4±0.2	0.5±0.2	0.8±0.4	0.03±0.2	0.08±0.08	0.4±0.2	1.5±0.5
P	<0.001	<0.001	<0.01	<0.001	<0.001	<0.001	

1. De Vries PMJM, Kouw PM, Olthof CG *et al.* The influence of dialysate sodium and variable ultrafiltration on fluid balance during hemodialysis. *ASAIO Trans* 1990; 36: 821–824
2. Po CL, Afolabi M, Raja RM. The role of sequential ultrafiltration and varying dialysate sodium on vascular stability during hemodialysis. *ASAIO J* 1993; 39: M798–M800
3. Sturniolo A, Costanzi S, Barbera G *et al.* Computerized monitoring of sodium and fluid during haemodialysis. *Nephrol Dial Transplant* 1990; [Suppl 1]: 162–164

Sex-dependent variations in peritoneal membrane transport properties in CAPD patients

Sir,

The transport ability of peritoneal membrane is dependent on both its effective surface area and its permeability. The peritoneal equilibration test (PET) is widely used to assess peritoneal membrane transport properties in CAPD patients [1,2]. Based on the ratios of dialysate/plasma creatinine (D/P_{Cr}) and 4th hour dialysate/initial dialysate glucose (D_4/D_{Oglu}) concentrations, patients can be classified as low, low-average, high-average, or high transporters. The PET-derived peritoneal transport properties in CAPD patients show distinct interindividual variabilities [3,4]. The contributions of effective peritoneal surface area and membrane permeability to variations in PET results cannot be clearly determined. The studies of Krediet *et al.* suggest that the interindividual variations in a CAPD population most likely reflect variations in effective surface area [4,5]. Moreover, it has been suggested that the surface area of the peritoneal membrane in adults is approximately equal to body surface area (BSA) [6]. Thus, the differences of BSA in CAPD patients may contribute to variations in PET results. However, the relation of patients' sex to peritoneal membrane transport properties has not been extensively studied.

Sixty CAPD patients, 32 male and 28 female, were studied. The mean age was 48.6±13.5 (range 15–75) years, and the mean duration on CAPD was 17.3±14.1 (range 3–56) months. All patients underwent a standard 4-h PET using a 2-l dialysate containing 2.5% glucose [1]. The ratios of D/P_{Cr} and D_4/D_{Oglu} were determined for each patient. The BSA was determined by the nomogram tables using patients' heights (cm) and weights (kg). The body mass index (BMI) was calculated according to following formula: BMI = weight (kg)/(height (m))^2.

The correlations between variables were calculated using Pearson's correlation coefficient. Stepwise multiple regression analysis was used to evaluate the independent effects of study parameters on the ratios D/P_{Cr} or D_4/D_{Oglu}. Furthermore, the patients were divided into two groups, female and male, and the study parameters were compared using unpaired Student's *t*-test or Fisher's exact test as appropriate.

The mean D/P_{Cr} ratio was 0.73±0.12, and the mean D_4/D_{Oglu} was 0.38±0.14 following a 4-h dwell time. The mean BSA was 1.70±0.20 m^2, and the mean BMI was 24.5±3.25 kg/m^2. According to the D/P_{Cr} ratio the patients were classified as low ($n=3$; 5.0%), low-average ($n=15$; 25.0%), high-average ($n=25$; 41.7%), and high ($n=17$; 28.3%) transporters. The D/P_{Cr} ratio was positively correlated with male sex ($r=0.381$, $P<0.01$) and BSA ($r=0.329$, $P=0.01$). The D_4/D_{Oglu} ratio was negatively correlated with male sex ($r=-0.454$, $P<0.001$) and BSA ($r=-0.297$, $P<0.05$). There was no relationship between the ratios of D/P_{Cr} or D_4/D_{Oglu} and age, duration on CAPD or BMI, but a significantly negative correlation was found between D/P_{Cr} and D_4/D_{Oglu} ($r=-0.718$, $P<0.0001$). In stepwise multiple regression analysis, male sex was found as the unique independent variable correlating with the D/P_{Cr} and D_4/D_{Oglu} ratios.

Comparison of the study parameters between male and female patients is shown in Table 1. In male patients, the BSA index and the D/P_{Cr} ratio were significantly higher

Table 1. Comparison between male and female patients of the study parameters

	Female patients	Male patients	*P* value
Age (years)	50.0±14.9	47.4±12.2	>0.05
Duration on CAPD (months)	16.3±11.8	18.5±15.7	>0.05
BSA (m^2)	1.57±0.15	1.81±0.16	<0.0001
BMI (kg/m^2)	24.4±3.7	24.5±2.9	>0.05
D/P_{CR}	0.68±0.12	0.77±0.10	<0.01
D_4/D_{Oglu}	0.44±0.16	0.32±0.08	<0.001

Downloaded from https://academic.oup.com/ndt/article/11/11/2375/1901743 by ANKARA user on 11 December 2021

($P<0.0001$ and $P<0.01$, respectively), and the D_4/D_{Oglu} ratio was significantly lower ($P<0.001$) than those of the females. The sum of the number of high and high-average transporters was significantly higher among male patients ($n=26$) than female patients ($n=15$, $P<0.05$).

These findings suggest that the peritoneal transport of low molecular weight solutes was increased in male CAPD patients. The significant relationships between the ratios of D/P_{Cr} or D_4/D_{Oglu} and BSA were supported that the increased peritoneal transport may be depended on higher BSA in male patients, but these relationships disappeared in multiple regression analysis. The BSA index was not an independent variable either for the D/P_{Cr} or D_4/D_{Oglu} ratios. Possibly, its effects on the D/P_{Cr} and D_4/D_{Oglu} ratios may be related to male sex. The effect of male sex on the ratios of D/P_{Cr} and D_4/D_{Oglu} appeared independent from the BSA index (effective peritoneal surface area). The causes of this effect were unclear. Male CAPD patients may have some problems related to increased peritoneal transport, including ineffective ultrafiltration, malnutrition or hyperlipidaemia which may in turn become poor prognostic factors.

Ankara University,
Faculty of Medicine,
İbn-i Sina Hospital,
Department of Nephrology,
Ankara, Turkey

K. Ateş
S. Ertürk
G. Nergisoglu
O. Karatan
N. Duman
B. Erbay
A.E. Ertuğ

1. Twardowski ZJ, Nolph KD, Khanna R *et al* Peritoneal equilibration test. *Perit Dial Bull* 1987; 7: 138–147
2. Twardowski ZJ. Clinical value of standardized equilibration tests in CAPD patients. *Blood Purif* 1989; 7: 95–108
3. Krediet RT, Boeschoten EW, Zuyderhoudt FMJ, Strackee J, Arisz L. Simple assessment of the efficacy of peritoneal transport in continuous ambulatory peritoneal dialysis patients. *Blood Purif* 1986; 4: 194–203
4. Zemel D, Krediet RT, Koomen GC, Struijk DG, Arisz L. Day-to-day variability of protein transport used as a method for analyzing peritoneal permeability in CAPD. *Perit Dial Int* 1991; 11: 217–223
5. Struijk DG, Krediet RT, Koomen GCM *et al* Functional characteristic of the peritoneal membrane in long-term continuous ambulatory peritoneal dialysis. *Nephron* 1991; 59: 213–220
6. Rubin JL, Clawson M, Plunch A, Jones Q. Measurements of peritoneal surface area in man and rat. *Am J Med Sci* 1988; 295: 453–458

Additional anti-HLA antibody detection by using PRA-STAT

Sir,

The diagnostic test PRA-STAT (SangStat) is an ELISA kit for the detection of HLA-specific IgG antibodies, which occur after sensitizing events such as pregnancy, blood transfusion, and organ transplantation. The ELISA offers some direct technical advantages over the conventional complement-dependent cytotoxicity (CDC) method: it does not require any cell preparation and the cell panel from which HLA molecules are derived to coat the ELISA plates does not vary from lot to lot [1]. Moreover, it gives additional results on antibodies that cannot be detected by standard CDC [2–4]. Indeed the ELISA method detects all types of IgG antibodies, including non-complement-fixing IgG2 and IgG4, while IgM auto- and alloantibodies are not identified.

Although recent reports have been made on the clinical applications of this test for the patients awaiting organ transplantation or experiencing graft rejection [5–9], there is a need to further document the benefits by prospective studies. The following observation illustrates one particular approach.

In 1995 a 41-year-old patient had been treated by haemodialysis since 2 August for end-stage renal failure due to chronic glomerulonephritis. As he was severely anaemic, and as routine preparation for kidney transplantation (he did not have any cytotoxic antibodies detected by CDC and PRA-STAT), he received two bags of phenotyped non-filtered blood from two different donors. Two weeks later, the patient was screened for the presence of anti-HLA antibodies: he was found negative by CDC (carried out at 25°C, then 37°C on 22 different cell samples) but when the same serum was tested by PRA-STAT, it was shown to contain significant amounts of specific antibodies towards HLA-A10, HLA-B27 and HLA-B62. As a consequence the HLA pheno-type of the two blood donors was determined. Donor 1 was found to be A3 A34 (split of A10) B62 B70 and donor 2 was found A26 (split of A10) A29 B35 B56. The antigen HLA-B27 was not found, which could imply either that the anti-B27 reaction of the tested serum is due to some other activation mechanism or to a broad cross reactivity.

Since only CDC results were available, we continued to give an additional blood transfusion from a third donor. Two weeks later, the serum of the patient was screened for the presence of anti-HLA anti-bodies and was found again to be negative by CDC. In contrast it showed a significantly positive result on PRA-STAT, this time with a specificity always towards HLA-B27 and HLA-B62 but also towards HLA-B57. Therefore the HLA phenotype of the third donor was determined and found to be A2 A24 B18 B57.

The agreement between the anti-HLA antibodies detected by PRA-STAT and the HLA phenotypes of the three donors was in sharp contrast with the negative results obtained by CDC. For this reason the sera were tested independently by flow cytometry on a selected cell panel (A. Cesbron and J. D. Bignon, CRTS, Nantes, France). They were shown to contain a clear anti-B62 reactivity; the specificities towards HLA-B27, HLA-B57 and HLA-B26 were more weakly present.

These data, with the concordance between PRA-STAT and flow cytometry, suggest that additional antibodies detected by PRA-STAT and not by CDC might belong to a category that does not fix complement efficiently, as antibodies belonging to the IgG2 and IgG4 isotypes.

The clinical relevance of the additional antibodies detected by PRA-STAT is to be further documented by prospective studies. At the moment, neither CDC nor PRA-STAT gives the maximum of information on the HLA immune status of patients. Therefore, if these antibodies detected by ELISA but not by CDC are relevant for blood transfusions and organ transplantation, it would be advisable to use both ELISA and CDC in screening policy to obtain more information. Additional costs of this complementary technique would be weighed against the significant cost of unwarranted blood transfusions and the potential post-transplant complications like acute rejection and graft loss, which require expensive drugs, longer hospitalization, and eventually result in an early return to dialysis. The use of additional diagnostic techniques may lead to significant savings in the global hospital budget and, as such, justifies the initial extra cost on the laboratory budget.

Acknowledgements. The authors thank Chantal Thaureaux and Alain Segers for the technical support during this study.

Downloaded from https://academic.oup.com/ndt/article/11/11/2375/1901743 by ANKARA user on 11 December 2021