therefore decided to perform an abdominal CT scan, observing diffuse parietal thickening of the ascending colon and caecum and inflammation of the adjacent mesenteric fat. As he did not show signs of improvement and in light of the radiological findings, metronidazole was added to the treatment with tobramycin and vancomycin in addition to performing a new peritoneal fluid culture. *Escherichia coli* and *Bacteroides merdae* grew in this culture after a few days, and the latter was resistant to metronidazole. All the previous antibiotic treatment was withdrawn, and intraperitoneal imipenem was started with a loading dose of 500 mg and subsequently with 200 mg/exchange for 15 days. The symptoms completely resolved without needing to remove the catheter.

E. corrodens and *P. oralis* are two anaerobic bacteria in the normal flora of the oral and gastrointestinal mucosa. They normally present infection with other anaerobic bacteria.[8] Starting treatment, for at least three weeks, with more than one drug to which they are normally susceptible over a prolonged period is therefore recommended.

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Vascular endothelial growth factor concentrations in peritoneal dialysis patients: Influence of biochemical and dialysis quality parameters and peritoneal transport rate

Concentraciones del factor de crecimiento endotelial vascular en pacientes en diálisis peritoneal: influencia de los parámetros bioquímicos y de calidad de diálisis y tasa de transporte peritoneal

Dear Editor,

Peritoneal dialysis (PD) is an established and beneficial replacement treatment for patients affected by end-stage renal disease (ESRD).[1] Long-term peritoneal dialysis (PD) is associated with the progressive development of functional and structural alterations of the peritoneal membrane affecting the outcome, such as angiogenesis, the formation of new blood vessels from pre-existing endothelium.[1] Vascular endothelial growth factor (VEGF), an angiogenic and vascular permeability factor, is a major mediator of increased angiogenesis.[2]

The aim of this study was to examine the factors influencing the serum (s) and drained dialysate (dd) VEGF concentrations in chronic PD patients and their correlations with biochemical findings, quality of PD, peritoneal membrane transport rate, dialysis modality and vintage, peritonitis and diabetes mellitus, use of erythropoietin stimu-

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Table 1 – Dialysis quality parameters.

Kt/V	2.17 ± 0.5
Total weekly ClCr	69.76 ± 20.62 L/weekly
RRF	3.04 ± 2.11 mL/min
Residual diuresis	718.10 ± 496.39 mL/day
nPCR	0.92 ± 0.24 g/day/kg BW
Glucose load	120.84 ± 20.43 g/day
D/D_0	0.39 ± 0.17
D/P	0.64 ± 0.11
Instilled dialysate	8503.87 ± 1101.81 mL/day
Drained dialysate	9583.57 ± 1462.13 mL/day

ClCr – creatinine clearance, RRF – residual renal function, nPCR – normalised protein catabolic rate, BW – body weight.

lating agents (ESA), angiotensin-converting enzyme inhibitors (ACEi) and statins. The observational study included 63 prevalent patients (39 males, 24 females), middle age 61.97 ± 11.01 years, treated with PD during 24 ± 18 months, using conventional low pH (5.5) peritoneal dialysate solutions with glucose concentration 1.25–2.76% at the Clinic of Nephrology, Clinical Centre of Serbia in Belgrade, Serbia. Fifty-three (84.5%) patients were on continuous ambulatory peritoneal dialysis (CAPD), 6 (9.5%) on automated peritoneal dialysis (APD) and 4 (4.5%) on cycling peritoneal dialysis, i.e. manual day dwells with dry period during the night (CCPD). Patients were free of peritonitis and clinical or laboratory signs of any infection at least 4 weeks before they were enrolled; 31 (49.2%) patients were affected by diabetes mellitus; 38 (60.3%) patients had one or more episodes of peritonitis; 41 (65%) patients received ESA, 46 (73%) ACEi and 12 (19%) statins.

Samples of serum, urine and peritoneal effluent were collected in the morning, before meal. Biochemical findings were analysed with the ARCHITECT ci8200, Abbott Diagnostics, Wiesbaden, Germany analyser. Kt/V, creatinine clearance (ClCr), normalised protein catabolic rate (nPCR), D/D_0, D/P and residual renal function (RRF) were assessed according to guidelines.[3,4] VEGF was measured in serum and peritoneal effluent using sandwich enzyme-linked immunoadsorbent assay (ELISA) kits (Quantikine® Human VEGF, R&D Systems, USA & Canada). The intra and the inter-assay variability were 2.6% and 9.8%. Lower detection level was 3.5 pg/mL.

The study has been approved by the Ethical Committee of the School of Medicine, University of Belgrade, and the patients gave informed consent for participation in the study.

Results are expressed as means, SD, minimum, maximum and median values. Correlations between variables were analysed by Pearson correlation test and Spearman rank correlation coefficient. The predictive value of different variables for VEGF levels was assessed with multivariate linear regression analysis. Statistical analysis was performed with SPSS 20.0.

The patients performed adequate dialysis (Table 1).

The sVEGF concentration was 231.84 ± 173.91 pg/mL (range 15.6–958.92 pg/mL) and ddVEGF concentration was 38.89 ± 49.38 pg/mL (range 15.6–223.8 pg/mL) and they correlated significantly ($R = 0.378$, $p = 0.002$).

Serum VEGF concentration correlated significantly with glycemia ($R = 0.362$, $p = 0.004$), fibrinogen ($R = 0.267$, $p = 0.034$) and transferrin saturation ($R = 0.272$, $p = 0.031$); ddVEGF concentration correlated with serum cholesterol ($R = 0.360$, $p = 0.004$).

In a model of multivariate linear regression analysis, patients' gender and age up to/over 65 years, dialysis modality (continuous peritoneal dialysis versus intermittent modalities with dry interval during the 24 h), diabetes mellitus, peritoneal dialysis duration up to/over 5 years, peritonitis, total weekly ClCr up to/over 70 L, total weekly Kt/V up to/over 1.7, D/D_0 up to/over 0.43, D/P up to/over 0.65, therapy with ESA, ACEi and statins were not significantly predictive for concentrations of VEGF in serum. In the same model age over 65 years ($p = 0.008$) and ACEi therapy were predictive ($p = 0.044$) of lower drained dialysate concentrations of VEGF (Table 2).

The significant correlation between the sVEGF and fibrinogen and glycemia, as well as ddVEGF and cholesterolemia seem to be indicative of higher VEFG concentrations in worse metabolic profile. Other studies also showed direct correlation between serum VEGF concentration and chronic inflammatory state, defined by plasma interleukin 6, CRP and fibrinogen levels in patients.[5,6]

A variety of factors influence the VEGF serum concentration.[5–7] Demographic factors, quality and modality of dialysis, comorbidities, applied therapy, glucose dialysate solutions load, dialysis duration did not influence sVEGF concentration in our study. Recent studies showed that genetic polymorphism may affect serum VEGF concentrations, which might explain the variety of findings in different trials.[8]

Tricky is the predictive value of older age for lower ddVEGF concentrations, requiring further evaluation. Important is the finding of significant predictive value of ACEi therapy for lower ddVEGF concentration, as ACE inhibition is known to

Table 2 – Predictive value of the observed variables for concentrations of vascular endothelial growth factor in drained dialysate (ddVEGF).

	t	sign.	95.0% CI	
			Lower	Upper
ddVEGF (pg/mL)	0.06	0.951	−27.49	29.24
Gender	−0.16	0.873	−27.81	23.70
Age (years)	−2.78	**0.008**	−83.99	−13.46
Dialysis modality	0.71	0.482	−16.80	35.11
Diabetes mellitus	−0.02	0.981	−38.24	37.35
Dialysis vintage (months)	−0.52	0.608	−32.64	19.30
Peritonitis	−0.73	0.466	−38.45	17.88
Total weekly ClCr	−1.09	0.280	−55.40	16.37
Total weekly Kt/V	0.98	0.332	−14.31	41.59
D/D_0	1.27	0.212	−11.04	48.58
D/P	−1.29	0.203	−43.75	9.54
ESA treatment	1.57	0.124	−5.83	46.81
ACEi treatment	2.07	**0.044**	0.92	60.69
Statins treatment	0.06	0.951	−27.49	29.24

ClCr – creatinine clearance; ESA – erythropoiesis stimulating agents; ACEi – angiotensin converting enzyme inhibitor; R – coefficient of correlation; sign. – significance; CI – confidence interval.
The bold values in Table 2 are signifficantly values.

preserve peritoneal membrane function and prevent morphological changes in experimental PD rat models on high-glucose dialysis solutions,[9] and in human pathology, a decrease of small solutes transport rate has been demonstrated on chronic PD and ACEi and/or angiotensin-receptor blockers treatment.[10]

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