The assessment of the role of VEGF-A, VEGFR-1 and TGF beta1 in pregnancy complicated by pre-eclampsia

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Objective
The purpose of the study was to evaluate the role of vascular endothelial growth factor (VEGF-A), vascular endothelial growth factor receptor (VEGFR-1) and transforming growth factor-beta1 (TGF-beta1) in pregnancy complicated by pre-eclampsia and normal uncomplicated pregnancy.

Methods
The study included 34 patients with pre-eclampsia and 35 women in the second and third trimester of uncomplicated pregnancy. The concentrations of VEGF-A, sVEGFR-1 and TGF-beta1 were measured with the use of immunoenzymatic assays.

Results
In the group of patients with pre-eclampsia the concentrations of VEGF-A were significantly lower when compared to healthy pregnant women (median 18.08 vs 22.7 pg/ml; p<0.01). In the study group the concentrations of VEGF-1 were significantly higher when compared to control group (median 3.58 vs 0.7 ng/ml; p<0.001). In every patient the concentrations of VEGF-A correlated negatively with the levels of sVEGFR-1 (R = -0.43). The concentrations of sVEGFR-1 in pre-eclamptic women correlated positively with the severity of symptoms of pre-eclampsia like systolic blood pressure (R = 0.76), diastolic blood pressure (R = 0.74), proteinuria (R = 0.46), protein concentrations in 24 hour urine collection (R = 0.42), the concentrations of uric acid (R = 0.58) and the concentrations of urea (R = 0.65). Moreover, in patients with pre-eclampsia the negative correlation between the concentration of VEGF-A and protein in 24 hour urine collection (R = -0.51) and diastolic blood pressure were observed. Moreover, we found positive correlation between level of VEGF-A and pregnancy week as well as neonatal weight. Furthermore, we observed that the higher concentrations of VEGF-1 were associated with the shorter time of pregnancy lasting (R = 0.41) and the lower neonatal weight (R = -0.58). The concentrations of TGF-beta1 in serum of patient with pre-eclampsia were significantly lower in comparison with women with uncomplicated pregnancy (median 15092 vs 17834 ng/mL; p<0.05).

Conclusion
Pregnancy complicated by pre-eclampsia was associated with increased concentrations of sVEGFR-1 and decreased concentrations of VEGF-A. These alterations may explain diffused damage of endothelium observed in pre-eclampsia. The increased concentrations of sVEGFR-1 were associated with severe clinical and biochemical symptoms of pre-eclampsia including: increase of systolic and diastolic blood pressure, increase of 24 h proteinuria as well as urea and uric acid concentrations. These results suggest direct influence of sVEGFR-R1 on endothelial function. The increased sVEGFR-1 and decreased VEGF-A were associated with worse perinatal outcomes – shorter time of pregnancy lasting and lower neonatal weight. These observations suggest the potential role of these markers in monitoring of pre-eclampsia. The concentrations of TGF-β1 in patients with pre-eclampsia were significantly higher when compared to healthy pregnant women. The observed decrease of TGF-beta 1 levels in serum of patients with pre-eclampsia may explain decrease of Treg population and excessive Th17 proliferation observed in this syndrome.