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The effect of uncontrolled hyperglycemia on levels of adhesion molecules in patients with diabetes mellitus type 2

Key words: diabetic kidney disease, glomerular filtration rate, hyperfiltration

Introduction

A properly functioning endothelium inhibits the adhesion of platelets and leukocytes to the surface of the vessel wall while maintaining a balance between pro-inflammatory, anti-inflammatory, pro-coagulant and anti-coagulant activity.

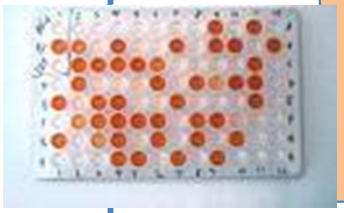
Vascular endothelial damage is a major cause of vascular complications in diabetes (Hadi and Suwaidi, 2007). Hyperglycemia is an important factor, which leads to vascular changes. In the state of hyperglycemia, glucose molecules, are non-enzymatically coupled with the lateral chains of lysine in proteins (the process of protein glycation).

In the course of diabetes changes occur in the concentration of several markers of endothelial damage such as: increased level of von Willebrand factor, thrombomodulin, sE-selectin, tissue plasminogen activator, and adhesion molecules ICAM-1 and VCAM-1. Increased concentrations of ICAM-1 are associated with an increased risk of type 2 diabetes (Hadi and Suwaidi, 2007).

Methods

The aim of this study was to evaluate the concentration of selected inflammatory markers associated with vascular endothelium: soluble forms of vascular adhesion molecule-1 (sVCAM-1), intercellular adhesion molecule-1 (sICAM-1), sE-selectin, and thrombomodulin (sTM) in patients with well-controlled type 2 diabetes and uncontrolled diabetes with micro-albuminuria.

The study included 62 patients diagnosed with T2DM. The first group (I) consisted of 35 patients with well-controlled type 2 diabetes (F/M 17/18, mean ages 64 yrs. The second group (II) covered 27 patients with uncontrolled type 2 diabetes with micro-albuminuria (F/M 10/17 mean ages 63 yrs). The control group consisted 30 healthy individuals (F/M 19/11), average ages 50 years.



Patients from group I had to satisfy the following criteria: a level of HbA1C of ≤6.5% and no vascular complications. However the qualification criterion of patients from group II was the value of glycated hemoglobin (HbA1c) ≥ 59 mM (≥7.5%) and identifying considerable albuminuria. In these patients, GFR was 40-60 ml/min./1.73m2.

Concentration ofsVCAM-1, sICAM-1, sTM, and sE-selectin was measered in plasma and it was performed by Enzyme Linked Immunosorbent Assay (ELISA).

Results and Conclusions

Lower concentrations of ICAM-1 were found in the group of uncontrolled diabetes patients compared with those with well-controlled disease. In patients with uncontrolled diabetes, VCAM-1 levels were significantly higher compared with the group with well-controlled diabetes. In patients with uncontrolled diabetes a positive correlation was obtained between glomerular filtration rate and sE-selectin and a negative correlation between the level of creatinine and ICAM-1, although there was a positive correlation between glycated hemoglobin and ICAM-1.

The study confirmed the participation of the inflammatory process associated with impaired vascular endothelial function in the pathogenesis of type 2 diabetes. The opposite effect of uncontrolled hyperglycemia on adhesion molecules suggests different functions of VCAM-1 and ICAM-1 in complications of diabetes.