Normal physiology constitutes a delicate balance between procoagulant and anticoagulant properties of haemostatic system, and a deficiency or exaggeration of any one may lead to either hemorrhage or vascular thrombosis, respectively\(^1\). Thrombs in blood vessels in the brain tissue is the cause of ischemic thrombotic stroke. This type of stroke is usually seen among elderly people, especially those with atherosclerosis, hypertension and diabetes mellitus (DM).

**Materials and Methods.** As it it known fibrinogen is one of the most important plasma proteins critical for hemostasis and clot formation. Its cleavage by thrombin (coagulation factor II) and subsequent polymerization forming fibrin strands provides the structural network required for effective clot formation. Besides a complex coupling of fibrinogen molecules and fibrin monomers that named the soluble fibrin monomer complex (SFMC) is formed in the early-activated state of blood coagulation. Thus such molecular complex is expected to serve as a parameter for the diagnosis of thrombus formation\(^2\). Abnormalities in the plasmatic coagulation system have been repeatedly described in patients with DM \(^3\) and have been linked to variety of vascular diseases, including atherosclerosis and ischemic stroke (IS). So the aim of the study was to determine the plasma prothrombin, fibrinogen and SFMC contents under acute ischemic stroke (IS) with or without type 2 diabetes mellitus. The case-control study included 87 patients (median age,
74.2 ± 9.0 years) who were admitted due to IS to the hospital and 25 population controls (mean age, 70.2 ± 10.3 years). IS was verified with clinical symptoms and brain CT imaging in 87 patients, 23 (26.4%) of whom had type 2 DM diagnosed according to the 1998 World Health Organization guidelines [4]. Levels of the plasma fibrinogen, SFMC and prothrombin level, glucose content and BMI (body mass index) were determined in all patients. Glucose level was estimated by enzymatic glucose oxidase method. Fibrinogen plasma level was estimated by gravimetry with next spectrophotometry assays [5]. Isolation of SFMC was done using the phosphate method with 0.1 M phosphate-buffered saline containing sodium citrate and 0.2% 6-aminohexanoic acid with following determination [6]. Prothrombin content was determined by ELISA. The significance of differences of prothrombin, fibrinogen and SFMC, glucose content and BMI between groups were determined by Mann-Whitney U test.

Results. The group of patients with IS+DM included individuals whose mean indicator of blood glucose was 9.47 ± 2.65 mmol/L, while in the group with IS this parameter was 4.93 ± 0.97 mmol/L. Body mass index (BMI) assessments revealed significantly high indexes in case of type 2 diabetes with ischemic stroke. The results showed IS patients had BMI within the normal range – 20.26 ± 1.6 kg/m², while under ischemic stroke with diabetes, this value was 34.01 ± 5.48 kg / m², p=0.023.

The research has established the statistically significant changes of fibrinogen and SFMC levels in both investigated patient groups in comparison with the control. So the fibrinogen blood content reached 130% and 135% in IS and IS+DM group respectively comparing with the control. SFMC was not detected in apparently healthy donors’ blood but in case of the investigated pathologies the quantity of these soluble fibrin monomer/fibrinogen complexes was sig-
nificantly higher. It should be noted that fibrinogen indexes were higher in the case of IS with DM, whereas SFMC had more deviated meanings comparing with the control parameters under ischemic stroke alone. Nevertheless statistically significant differences of fibrinogen and SFMC levels in patients with ischemic stroke and stroke complicated by diabetes were not detected. The established index of pro-thrombin content was 0.74±0.18 e.u. for blood of IS+DM patients and 0.74±0.199 e.u. for blood of patients with IS only. The benchmark of prothrombin content for apparently healthy donors’ blood was 0.63±0.15 e.u. Thus the plasma prothrombin contents were increased by 18% from the control for the both investigated groups of patients and there were not detected any significant differences of prothrombin between patients with both investigated diseases and these parameters were insignificantly higher comparing to the control. The obtained results have shown that ischemic stroke with and without type 2 diabetes mellitus are characterized by similar changes of the investigated hemostasis parameters. The higher quantity of blood SFMC were established of the patients’ blood with stroke solely. The prospects for further research is evaluating of the significance of biochemical haemostatic markers as predictors of mortality in stroke regardless of diabetes.

References


Key words: stroke; diabetes mellitus, type 2; blood coagulation factors

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