

HCl-induced hemolysis in the patients with disturbance of thyroid function

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Thyroid dysfunction is one of the most common endocrine disorders (Gardner et al., 2011). These disorders are divided into two types: hypothyroidism and hyperthyroidism reflect the deficiency and excess secretion of thyroid hormones (Romer, 1998; Ortiga-Carvalho et al., 2014). Regardless of the cause, the consequences of both low and high secretion of thyroid hormones are predictable, taking into account the knowledge of the functions of thyroid hormones (Mullur et al., 2014; Mancini et al., 2016). Thyroid hormones are known to influence the balance between the generation of reactive oxygen species (ROS) and the antioxidant defense system of cells (Venditti and Di Meo, 2006; Villanueva et al., 2013). It has been shown that hyperactivity increases the production of ROS by causing oxidative stress in the cell and facilitating cell damage (Oppenheimer et al., 1994). On the other hand, the metabolic state caused by hypothyroidism may have a protective function. Erythrocytes are the most sensitive to the effects of oxidative stress, mainly because they participate in the transport of oxygen, and therefore are directly exposed to it (Çimen Burak, 2008). The hemoglobin in the erythrocyte contains iron (II) ions, which enable the Fenton reaction and catalyze lipid peroxidation (Zapora and Jarocka, 2013). In this study, we aimed to analyze the changes in the resistance of erythrocyte membranes to the effects of hemolytic factors (HCl-induced resistance) in patients with disturbance of thyroid function.

The assessment of the levels of thyroid hormones and resistance of erythrocyte membranes to the HCl was carried out on 153 individuals, i.e. 71.55%

were women and 28.45% men. All these individuals were divided into groups: euthyroidism, with primary hypothyroidism, with latent (subclinical) hypothyroidism, with primary hyperthyroidism, with latent (subclinical) hyperthyroidism, with autoimmune thyroiditis. The blood samples were collected from the ulnar vein into the blood clot tubes (Serum Clot Activator). The HCl-induced resistance of the erythrocytes was measured spectrophotometrically by the method described by Terskov and Hitelzon (1957).

The analysis of the HCl-induced erythrocyte hemolysis in the blood of men and women with thyroid dysfunction showed the following trends. Statistically significant changes in the number of hemolyzed erythrocytes were obtained between the values in the groups of men with subclinical hyperthyroidism, primary hyperthyroidism, and euthyroidism. An increase in the percentage of hemolyzed erythrocytes at the beginning of hemolysis was noted in women with subclinical hyperthyroidism. Comparing the groups of women and men with primary hyperthyroidism, a lower percentage of hemolyzed erythrocytes was obtained in the women group. A higher percentage of hemolyzed erythrocytes has been shown in women with subclinical hypothyroidism. When analyzing the group of men with euthyroidism and subclinical hypothyroidism, a reverse tendency of changes was demonstrated.

The analysis of the HCl-induced hemolysis of erythrocytes in the group of women showed no statistically significant differences between patients with euthyroidism and primary hypothyroidism. However, in the male group, the HCl-induced hemolysis of erythrocytes differed significantly between patients with euthyroidism and primary hypothyroidism. The erythrogram of the HCl-induced hemolysis in men with primary hypothyroidism was very shifted to the right and flat (increased hemolysis time and decreased percentage of hemolyzed erythrocytes). The HCl-induced hemolysis in women with autoimmune thyroiditis was shifted to the left compared to the group of women with euthyroidism (reduced time of maximum hemolysis and increased number of hemolyzed erythrocytes). A statistically significant increase in the percentage of hemolyzed erythrocytes was obtained in the group of women with autoimmune thyroiditis compared to the group of women with the euthyroid state. Different trends were obtained by comparing the men groups among themselves. Men with autoimmune thyroiditis had a lower percentage of hemolyzed erythrocytes compared to the group of men with euthyroidism. The obtained results will allow for precise individual determination of the principles of diagnostics and treatment of thyroid diseases depending on age and gender.