



## **DYSCIRCULATORY ENCEPHALOPATHY ON THE BACKGROUND OF HYPOTHYROIDISM**

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<b>Received:</b> February 28 <sup>th</sup> 2022 <b>Accepted:</b> March 26 <sup>th</sup> 2022 <b>Published:</b> May 6 <sup>th</sup> 2022	Chronic insufficiency of cerebral circulation, or discirculatory encephalopathy, is a widespread group of cerebral vascular diseases (detected in 20 - 30% of persons of working age and tends to increase in the structure of vascular diseases of the nervous system). This pathology is based on multifocal or diffuse lesions of the brain, manifested clinically by neurological, neuropsychological and/or mental disorders caused by chronic cerebral vascular insufficiency and/or repeated episodes of acute violations of cerebral circulation. Cognitive impairment is one of the main clinical manifestations of chronic cerebral circulatory insufficiency.

**Keywords:** Thyroid Hormones, Lipid Status, Clinical Hypothyroidism, Subclinical Hypothyroidism, Discirculatory Encephalopathy

**INTRODUCTION:** The prevalence of hypothyroidism in Russia among the population is constantly increasing. The highest prevalence of hypothyroidism is observed in the age group of postmenopausal women older than 50 years. Clinical manifestation of endothelial dysfunction in patients with hypothyroidism is discirculatory encephalopathy (DE), a cerebral pathology that develops as a result of metabolic and vascular disorders.

**THE AIM OF THE WORK** was to identify discirculatory encephalopathy in different types of hypothyroidism compensation and the influence of lipid status and thyroid hormones on its development.

**MATERIALS AND METHODS:** The study included 60 women 50-54 years old with clinical and subclinical hypothyroidism in the anamnesis. In all nosological units accompanied by hypothyroidism syndrome, an endocrinologist was obliged to detect neurological disorders. Thyroid status (TSH, s.T4, s.T3) was assessed twice, with an interval of 6 months. Determination of antibodies to TPO was obligatory in the study of thyroid gland, because increased thyroperoxidase antibodies in patients indicated lesion of central nervous system. Hypothyroidism in patients of the main group was caused by autoimmune thyroiditis. In order to detect hypertensive encephalopathy, BP was investigated in all study subjects; women with BP 125+4.0 / 70+10 mm Hg were included in the study. In addition to the above,

the vessels of the neck were examined by duplex scanning on a General Electric Vivid 3.0 device (General Electric Healthcare, USA). Depending on the results obtained, all the women included in the study were divided into 2 groups: Group 1 included 30 patients with subcompensated hypothyroidism (TSH>4.5 mU/l, s.T4 within reference values) and Group 2 included 30 patients with decompensated hypothyroidism (TSH above and s.T4 below normal). Exclusion criteria were thyroid hyperfunction, history of cancer, stroke or heart attack. Women under study had subjective or objective mild cognitive deterioration: decrease of memory, attention and intellect, lethargy, apathy, somnolence, the degree of these disorders depended on severity of thyroid function decrease. These symptoms preceded neuromuscular manifestations such as Hoffman syndrome, hypothyroid myopathy. These conditions were emotionally colored: anxiety, unmotivated fears, vitriolic longing appeared against the background of shortness of breath. The difference between these states and panic attacks was their duration and stereotype. It should also be emphasized that the prescription of Novopassit did not decrease the frequency and duration of seizures, but the prescription of thyroid hormone replacement therapy contributed to a decrease in neurological symptoms. Data were statistically processed using Microsoft Excel 2010 and Statistica 7. To compare the significance of differences in the results obtained, we used nonparametric Wilcoxon criterion. Differences between



the compared parameters were considered significant at  $p < 0.05$ .

**RESULTS OF THE STUDY AND THEIR DISCUSSION.** Our work showed that the group of patients with clinical hypothyroidism had significantly higher values of body mass index (BMI). The values of serum TTU were higher, and s.T4 was lower in the group of patients with compared to the control group and the group with subcompensated hypothyroidism ( $p < 0.5$ ). Also, high antibodies to thyroperoxidase were detected in this group. It is known that hypothyroidism is closely associated with cardiovascular metabolic syndrome, especially with dyslipidemia and abdominal obesity, so the revealed changes of lipid spectrum (increase of total cholesterol and LDL) in our study in patients with decompensated hypothyroidism indicate high risk of atherosclerosis and, thus, cause endothelial dysfunction and development of discirculatory encephalopathy. The manifestation of neurological symptomatology is promoted by the presence of AT to TPO, which was elevated in group 2 women, the lowest values of thyroid hormones and the highest changes in lipidogram were in women with decompensated hypothyroidism. Indicators Control group (n=30) Subclinical hypothyroidism (n=30) Clinical hypothyroidism (n=30). Patients with decompensated hypothyroidism had the greatest number of complaints. Reduced memory and decreased attention, intelligence were in the same patients, which suggested increased functioning of the autonomic nervous system and the presence of encephalopathy. Also during the study, a paradoxical picture was revealed: patients with the phenomenon of subclinical hypothyroidism exhibited attacks similar to panic attacks characteristic of thyrotoxicosis. These states with expressed emotional and vegetative coloring occurred independently or after provocation of psycho-emotional load, developed sometimes in the same environment or at the same time of day or night lasting up to 12 hours and were not associated with menopause. Marked disorders of cardiovascular system regulation were manifested by changes of heart rhythm variability towards sympathicotonia: rapid pulse, increased blood pressure, pale skin, goosebumps on hands. Patients complained of shortness of breath, dissatisfaction with breathing, shortness of breath on inhalation. The study of common carotid and vertebral arteries of patients with clinical hypothyroidism, compared with patients with subclinical hypothyroidism, revealed increased diameter of common carotid artery and intima-media thickening of common carotid artery with no reliable

changes in peak systolic blood flow rate. This indicates decreased elasticity and structural changes of the common carotid artery and vertebral arteries. After identifying patients with the most frequent complaints against the background of hypothyroidism in the 2 groups, the correlation correlation of neck vessels with lipidogram was carried out. Lipid status correlation appeared only with common carotid artery indices and demonstrated direct relationship of common carotid artery diameter and total cholesterol, blood flow and LDL cholesterol, inverse relationship of intima-media OSA and HDL cholesterol. We can see that different correlations appeared in the 2 groups between the parameters of the common carotid artery and thyroid hormones, whereas no relations with the vertebral artery were found. The presence of a direct relationship between the diameter of the common carotid artery and thyroid hormone and the detected thickening of neck vessels, thickening of the intima-media complex indicated an atherosclerotic process and indirect signs of the beginning of cerebral circulatory disorders. The obtained data differed from the foreign literature, where the main marker of metabolic changes in the vascular wall locally was sv T4, whereas in our study sv T3, which indicated a more obvious metabolic disorder, which indirectly led to the progression of neurological clinic.

#### **CONCLUSIONS:**

1. The group with decompensated hypothyroidism revealed structural changes in the common carotid and vertebral arteries, which led to the appearance of neurological symptoms, i.e., discirculatory encephalopathy.
2. In the group with subclinical hypothyroidism changes of the common carotid and vertebral artery were less pronounced and, accordingly, clinical symptomatology was less pronounced.
3. Group 2 demonstrated a significant increase in intima-media of the common carotid artery against the background of vessel thickening, which indirectly indicates endothelial dysfunction and the presence of discirculatory encephalopathy, which is manifested as increased autonomic symptomatology.
4. Decreased blood flow in patients with clinical hypothyroidism suggested more pronounced atherosclerosis and refined diagnosis to detect atherosclerotic plaques. Markers of atherosclerosis progression and hence endothelial dysfunction were indicated by elevated cholesterol, high LDL and triglycerides in patient groups 1 and 2.
5. Appearance of connections of thyroid hormones with common carotid artery indices, especially TTG



and sv T3 were associated with metabolic changes, which also led to endothelial dysfunction and further encephalopathy. This was also indicated by the level of thyroperoxidase antibodies.

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