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## ANALYSIS OF INTERNAL GLAND LESIONS IN PATIENTS WITH COVID-19

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## COVID-19 БИЛАН ОҒРИГАН БЕМОРЛАРДА ИЧКИ БЕЗЛАР ТОМОНИДАН КУЗАТИЛАДИГАН ЎЗГАРИШЛАРНИ ТАҲЛИЛ ҚИЛИШ

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## АНАЛИЗ ПОРАЖЕНИЙ ВНУТРЕННИХ ЖЕЛЕЗ У ПАЦИЕНТОВ С COVID-19

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**Резюме.** Пандемия даврида COVID 19 миллионлаб инсонларнинг ҳаётига зомин бўлди. Бу касалликнинг қандли диабет билан оғриган одамларда янада оғирроқ кечиши эҳтимоли қайд этилган ва бу беморлар пандемия даврида асосан эндокринологларнинг эътиборини тортган бўлса-да, COVID 19 нинг ҳақиқий эндокрин кўринишлари ҳали батафсил кўриб чиқилмаган. Гипофиз, гипоталамус, қалқонсимон без ва буйрак усти безларининг коронавируслар томонидан зарарланиши, уларнинг COVID 19 касаллигида структуравий ва функционал бузилишлари ҳақидаги маълумотлар касалликдан олдинги ва касалликдан кейинги клиник тадқиқотларнинг ишончли натижалари йўқлиги сабабли жуда кам. Эндокрин патологиялар энг оғир сурункали касалликлари қаторига киради. Эндокринопатияларнинг ривожланиши ва ривожланишига COVID 19 нинг провокацион таъсири хавфи мавжуд. Тадқиқот натижалари эндокрин тизимнинг бир қатор касалликларининг кенг тарқалганлиги ва тез-тез учрайдиган асоратларини бартараф этишини ҳисобга олган ҳолда жуда долзарб ҳисобланади.

**Калит сўзлар:** гормонлар, эндокрин безлар, COVID 19.

**Abstract.** COVID-19 claimed the lives of millions of people during the pandemic. The disease is more severe in people with diabetes, and these patients attracted the attention of endocrinologists during the pandemic, the true endocrine manifestations of COVID-19 have not yet been studied in detail. Data on the defeat of the pituitary gland, hypothalamus, thyroid gland and adrenal glands by coronavirus, their structural and functional disorders in COVID-19 disease are scarce due to the lack of reliable results of clinical studies before and after the disease. Studies have shown that disorders of the immune response play an important role in the development of diseases of the endocrine system (diabetes mellitus, thyroid diseases, autoimmune syndromes, adrenal insufficiency, etc.). Endocrine pathologies are among the most severe chronic diseases. There is a risk of provocative effects of COVID-19 on the development and progression of endocrinopathies. The study of the mechanisms of action of COVID-19 on the endocrine system is currently being initiated by researchers.

**Keywords:** hormones, COVID-19, endocrine glands.

The "new disease" causing acute respiratory distress syndrome, COVID-19, has claimed the lives of millions during the pandemic. The disease can be asymptomatic and continue with the development of severe viral pneumonia. It also leads to complications such as acute respiratory syndrome and sepsis, myocarditis and kidney failure. Although the disease is more likely to be more severe in people with diabetes, and these patients have attracted the attention of endocrinologists during the pandemic, the true endocrine manifestations of COVID-19 have not yet been studied in detail. The study of the mechanisms of action of COVID-19 on the endocrine system is currently being initiated by researchers. The results of such studies are very relevant, given the prevalence of a number of diseases of the endocrine system and the elimination of common complications.

**Relevance.** During the pandemic, COVID-19 claimed the lives of millions of people. The disease

also leads to an asymptomatic course and complications such as severe viral pneumonia, acute respiratory syndrome and sepsis, myocarditis and renal failure. It has been noted that this disease will be more severe in people with diabetes, and although these patients have mainly attracted the attention of endocrinologists during the pandemic, the true endocrine manifestations of COVID 19 have not yet been considered in detail. Data on the defeat of the pituitary gland, hypothalamus, thyroid gland and adrenal glands by coronaviruses, their structural and functional disorders in COVID 19 disease are extremely rare due to the lack of reliable results of clinical studies before and after the disease.

The essence of the study is to study the reaction of the pituitary gland and adrenal glands caused by changes in the secretory activity of the endocrine organs under the influence of various COVID - 19 diseases that cause changes in the adaptive systems of

the body. In addition, comparing the reactions of the pituitary gland (somatotropin) and the adrenal glands (cortisol) in various forms of the severity of COVID-19 disease is one of our main tasks. Under the influence of somatotropin and cortisol, energy and homeostatic provision of muscle activity is observed. Timely and full sleep, high-quality nutrition, adequate physical activity - all this makes the body resistant to stress. As a result, the body's need for cortisol decreases. The main purpose of our study is to analyze changes in the function of internal glands in COVID-19 disease.

**The purpose of the study:** based on the data of scientific publications, the analysis of changes in the functions of internal glands in COVID - 19.

International and national associations have prepared various recommendations for the management and treatment of patients with various endocrinopathies (from diabetes, hyper- and hypocorticism) during the COVID-19 pandemic [1], but they are intended for patients with clinically justified diagnoses in comorbid situations. Thanks to these recommendations, the probability of assessing real endocrine disorders in patients with COVID-19 is reduced. These recommendations, based on the general principles of treating people with thyrotoxicosis and hypothyroidism in viral epidemics, emphasize the need to continue previously prescribed therapy, and also focus on the similarity of signs of agranulocytosis and infectious diseases. It does not include an in-depth analysis of diseases of the endocrine glands. However, with agranulocytosis, which has developed as a side effect of thyrostatic therapy, the symptoms of COVID - 19 are often similar, which often complicates the comparative diagnosis of these diseases. In this case, it is recommended to immediately stop taking the drug and immediately conduct an extended general blood test [6]. So far, what residual signs are observed in those who have suffered this disease in one form or another, including how this infection itself affects the condition of the thyroid gland, adrenal glands and pituitary gland, as well as methods of treating these signs are not fully covered. The results of studies conducted during the pandemic show that residual functional and morphological changes in the endocrine system can be observed with COVID-19 disease.

In clinical studies, a decrease in the average thyroid mass was noted as a result of a decrease in the size of the magnifying glass of the follicle and a decrease in the colloid [10]. Degradation of follicular cells is observed with a decrease in T3 and T4 levels, however, damage to parafollicular cells can lead to a decrease in serum calcitonin levels. Calcitonin deficiency leads to a decrease in the number of osteoclasts, resulting in osteonecrosis. It is written in the scientific literature that T3 syndrome can develop in systemic diseases [2]. For this reason, it is not rec-

ommended to check thyroid function during the acute period of COVID-19. In addition to the usual clinical picture of thyrotoxicosis, which is not associated with TSH, high values of T3 and T4 are confirmed by markers of inflammation and leukocytosis. The main role in the development of thyroid diseases is played by disorders in the activity of the hypothalamic-pituitary-thyroid system, including disorders in the biosynthesis of thyroid hormones associated with various environmental or genetic factors. It is known that coronaviruses are a receptor of human angiotensin converting enzyme 2 (APF2) when they enter khujara. It accumulates in most tissues, including a number of organs of the endocrine system, such as the pancreas, thyroid gland, testicles, ovaries, adrenal glands and pituitary gland [3, 4].

R. Pal and M. Banerjee (2020) [6] note that to date there is insufficient information about possible damage to the endocrine system in patients with COVID-19. It is known that APF2 acts as a receptor for coronavirus in pneumocytes, but, in turn, viral RNA is detected in plasma, which confirms that the virus can also interact with APF2 in other tissues [5]. Studies have shown that SARS-CoV-2 can cause pituitary or hypothalamic damage due to edema and neuron degeneration. In the near future, the study of patients with COVID-19 will remain promising in assessing the risk that may lead to the development of secondary (central) hypothyroidism by damaging the hypothalamus and pituitary gland [6, 7]. Typical neurological manifestations of COVID-19 disease - olfactory impairment - are explained by the expression of APF2 in olfactory epithelial cells [5].

The tissues of the hypothalamus and pituitary gland also express APF2 and theoretically can become targets for the virus. During the studies, patients with SARS-CoV-2 were taken under observation. After 3 months, central hypocorticism was detected in 40% of them. 87.5% of them expressed typical complaints of weakness and postural dizziness. 5% also had central hypothyroidism. It has been suggested that these patients may develop pituitary or hypothalamic-pituitary dysfunction. Theoretically, its indirect sign would be to fix the phenomenon of diabetes without sugar, but currently, for obvious reasons, the problems of hypernatremia in people with severe COVID 19 are considered in the context of the consequences of pyrexia and cases of development. However, until then, a case of sugar-free diabetes after recovery from COVID-19 has not been described. Hypothalamic-pituitary dysfunction is a decrease in adaptive reserves due to pituitary gland with clinically primary hypothyroidism and central hypocorticism. In the SARS-CoV-2 virus, it is assumed that some amino acid sequences have molecular similarities, for example, with the influenza virus, and that the "immunoinvasive strategy" of the virus is

carried out due to the similarity in reducing the spread of cortisol.

This condition is due to the fact that the body of an infected person reacts to stress. In addition, antiviral antibodies will have the ability to mutually inactivate adrenocorticotrophic hormone [8]. It is known that Il-1 and Il-6 produced by inflammatory cells are stimulators of the endocrine system through the synthesis of ACTG. Activation of the hormone occurs in different organs, but mainly in the liver.

Induction of  $11\beta$ -GSD and an increase in the concentration of hormones under its influence can cause a negative feedback reaction and, as a consequence, dysfunction of the hypothalamic-pituitary-adrenal axis. Like other molecules regulating blood circulation, cortisol level corresponds to the circadian rhythm, reaches its peak in the morning and decreases in the evening. Cortisol regulates the levels of several anti-inflammatory cytokines in the blood, such as il-2, il-3, il-6, FNO-a and ifn- $\gamma$ , which are in rotational motion. In addition, it affects the activity and viability of cells of the immune system. Glucocorticoids also inhibit the phagocytosis of antigens and their subsequent destruction by macrophages. They suppress cellular and humoral immune responses, maintaining a balance of pro-inflammatory and anti-inflammatory reactions. Causes invulnerability of lymphoid organs. Cortisol suppresses the phagocytic activity of neutrophils and macrophages, reduces the activity of lymphocytes, stops their differentiation, and stimulates apoptosis. Due to their immunosuppressive effect, glucocorticoids reduce the number and activity of inflammatory cells, especially tissue macrophages, limiting their ability to respond to antigens. Suppression of immune cell activity disrupts their degranulation and the release of tissue-destroying enzymes [9].

**Conclusion:** An important place in the development of diseases of the endocrine system is occupied by disorders of the immune response. Currently, researchers are beginning to study the mechanisms of the effect of COVID-19 on the internal endocrine system. The results of such studies are considered very relevant, taking into account the prevalence and elimination of frequent complications of a number of diseases of the endocrine system.

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#### АНАЛИЗ ПОРАЖЕНИЙ ВНУТРЕННИХ ЖЕЛЕЗ У ПАЦИЕНТОВ С COVID-19

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**Резюме.** COVID-19 унесла жизни миллионов людей во время пандемии. Заболевание чаще протекает тяжелее у людей с диабетом, и эти пациенты привлекали внимание эндокринологов в период пандемии, истинные эндокринные проявления COVID-19 до сих пор детально не изучены. Данные о поражении коронавирусом гипофиза, гипоталамуса, щитовидной железы и надпочечников, их структурно-функциональных нарушениях при заболевании COVID-19 скудны из-за отсутствия надежных результатов клинических исследований до и после заболевания. Исследования показали, что нарушения иммунного ответа играют важную роль в развитии заболеваний эндокринной системы (сахарный диабет, заболевания щитовидной железы, аутоиммунные синдромы, надпочечниковая недостаточность и др.). Эндокринные патологии относятся к числу наиболее тяжелых хронических заболеваний. Существует риск провокационного воздействия COVID-19 на развитие и прогрессирование эндокринопатий. Изучение механизмов действия COVID-19 на эндокринную систему в настоящее время иницируется исследователями.

**Ключевые слова:** гормоны, COVID-19, эндокринные железы.