MORPHOLOGICAL CHANGES IN THE INTERSTITIAL TISSUE AND BLOOD VESSELS OF ZONA FASCICULATA IN CORTEX OF THE ADRENAL GLAND IN COVID-19 INFECTION

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Abstract

In COVID-19 infection, severe dyscirculation, edema, hemorrhages and inflammatory infiltrates are observed in the interstitial tissue and blood vessels of the cortical layer of the adrenal gland. It is determined that the histotopographic area where the blood vessels are located, that is, the interstitial tissue, is subject to severe edema and hydration, especially in the subcapsular area, the interstitial tissue of zona glomerulosa and fasciculata, the edematous process is rapidly developing.

Keywords: COVID-19, adrenal gland, cortical layer, zona fasciculata, fibrinoid necrosis, thrombosis, infarction.

Zona fasciculata of the adrenal cortex occupies two-thirds of the gland and is composed of large adrenocorticocytes forming long columns. They mainly synthesize glucocorticoid hormones such as cortisol and cortisone, affect the immune system, slow down the growth of connective tissue, reduce the speed of inflammatory and allergic processes. Today, more than 50 steroid compounds synthesized by the adrenal cortex have been identified. They are divided into two groups: glucocorticoids and mineralocorticoids, the first mainly affects the metabolism of carbohydrates, and the second controls the metabolism of minerals.

It was found that in COVID-19 infection, the adrenal blood vessels and then the parenchymal cells may be damaged first. The development of fibrinoid necrosis of the vascular wall, thrombosis and infarction in the gland tissue continues with irreversible damage to the adrenal parenchyma, which leads to impaired hormone synthesis and metabolism in internal organs. Therefore, the study of adrenal damage in COVID-19, including pathomorphological changes developing in the cortical fascicular zona, is an urgent problem.

The results of our study showed that the morphofunctional areas of the adrenal cortex of patients who died from COVID-19 infection underwent various morphological changes, including dilation of blood vessels, hyperemia, and the development of perivascular hemorrhages in some areas. The histotopographic area where the blood vessels are located, that is, the interstitial tissue, is subject to severe edema and hydration, especially in the subcapsular area, the capsule and fascicular zona, where the edema process has developed rapidly. In COVID-19, under the influence of the SARS-CoV-2 virus, initially the arteries and arterioles in the outer membrane become fibrinoid, and some of them become thrombosis,

resulting in the development of acute dyscirculation in the blood vessels entering the gland parenchyma, and as a result of damage to the interstitial tissue, the accumulation of acidic glycosaminoglycans, and the hydration and edema of the tissue were observed.

The blood vessels in this area were found to be sharply dilated and full-blooded in some places. When the connective tissue fibrous structures in the blood vessel wall and interstitial tissue of the adrenal gland were stained with picrofuchsin, it was found that the connective tissue fibers and blood vessels in the outer membrane passed through the capsule area, entered the fascicular zona, and spread, and the innermost area entered the reticular zona. When the fascicular zona of the adrenal cortex was examined under a large objective of a microscope, it was found that the blood vessels in the interstitial tissue were sharply dilated and full-blooded, and some of them were surrounded by perivascular blood. In some areas of the interstitial connective tissue, it was found that lymphoid cells formed separate clusters around the blood vessels.

As the dyscirculation process that began in the arteries and arterioles of the outer layer of the adrenal gland under the influence of COVID-19 infection spreads into the gland tissue, the capillaries in the interstitial tissue of the fascicular zona expand and fill with blood, and rupture of blood vessels at the border of its reticular layer, massive blood infiltration into the interstitial tissue and gland parenchyma is detected. It is observed that the infused blood completely occupies the interstitial tissue, leading to the twitching, disordered arrangement of parenchymatous cells, and the destruction and necrosis of some cells. It is determined that the remaining parenchymatous cells are located in separate clusters and that regenerated cells appear among them.

It is determined that the blood cells poured into the fascicular zona of the adrenal gland disintegrate, are absorbed by macrophages and other connective tissue cells, and turn into hemoglobinogenic pigments, as a result of which the histiocytic cells and macrophages of the connective tissue multiply in the interstitial tissue, and an infiltrate appears. It was observed that the parenchymatous cells of the fascicular zona of the gland lost their columnar arrangement and were randomly arranged, most of the cells underwent necrosis and necrobiosis, and necrosis foci appeared in the form of microinfarcts. Among the parenchymatous cells, it is determined that there are regenerating and recovering cells. These cells are relatively small in size, the cytoplasm is thin and eosinophilic, and the nucleus is round and relatively larger.

In conclusion, COVID-19 infection is characterized by severe dyscirculation, edema, hemorrhages, and inflammatory infiltrates in the interstitial tissue and blood vessels of the adrenal cortex.

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